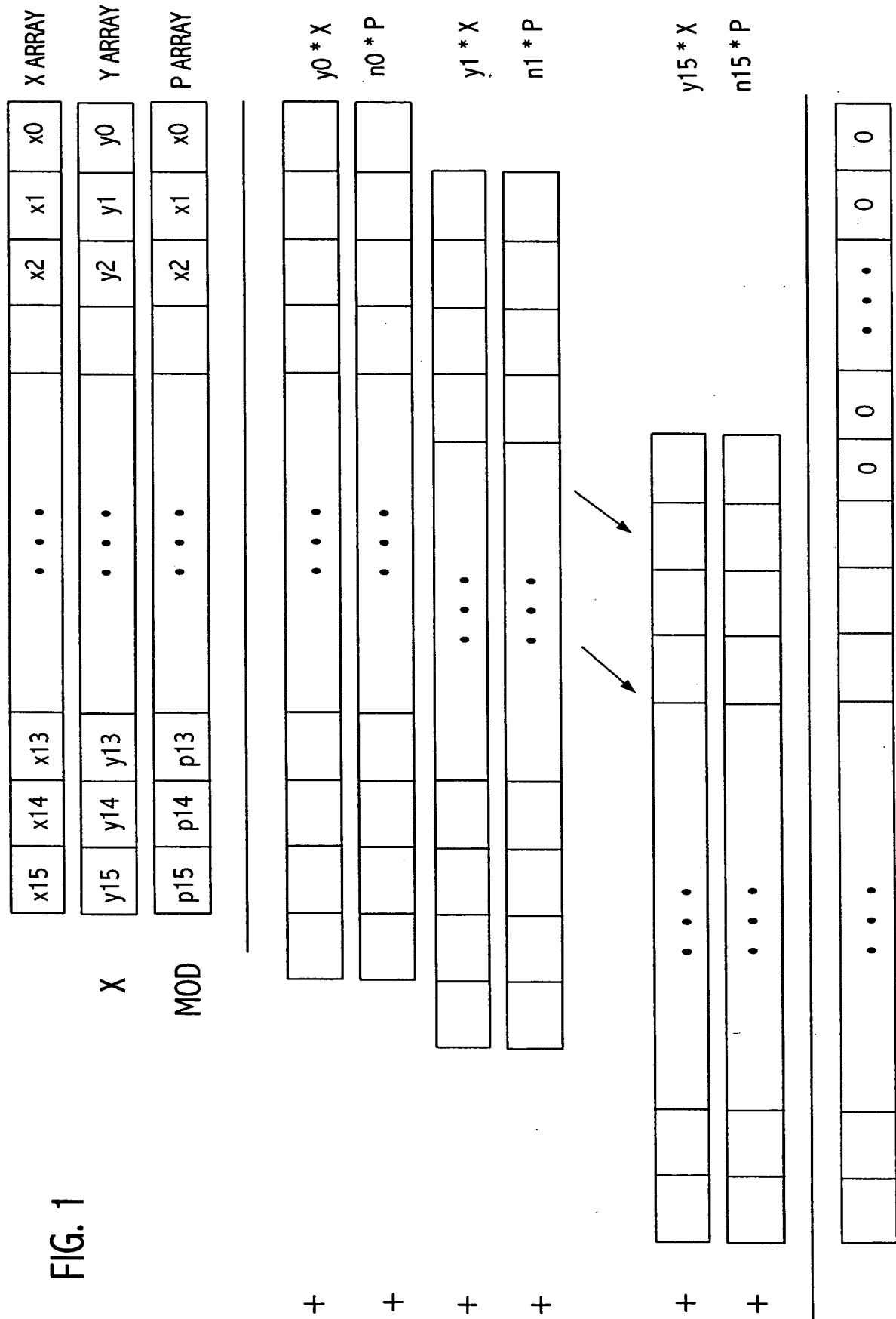


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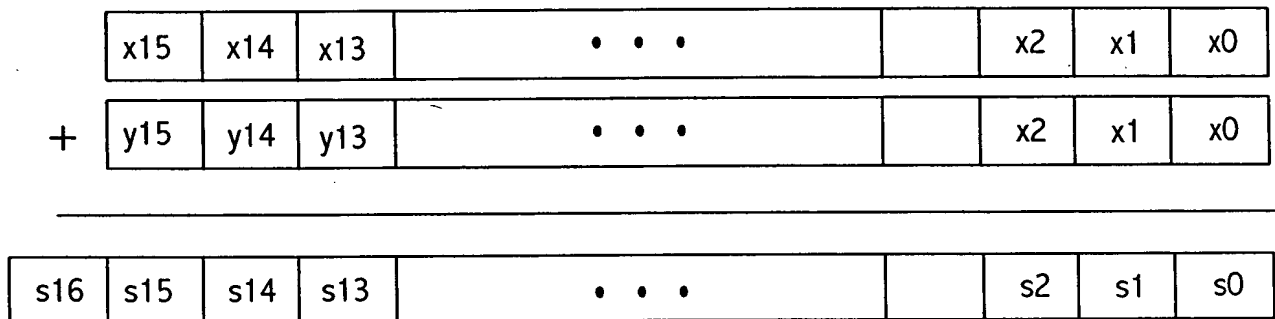


FIG. 2

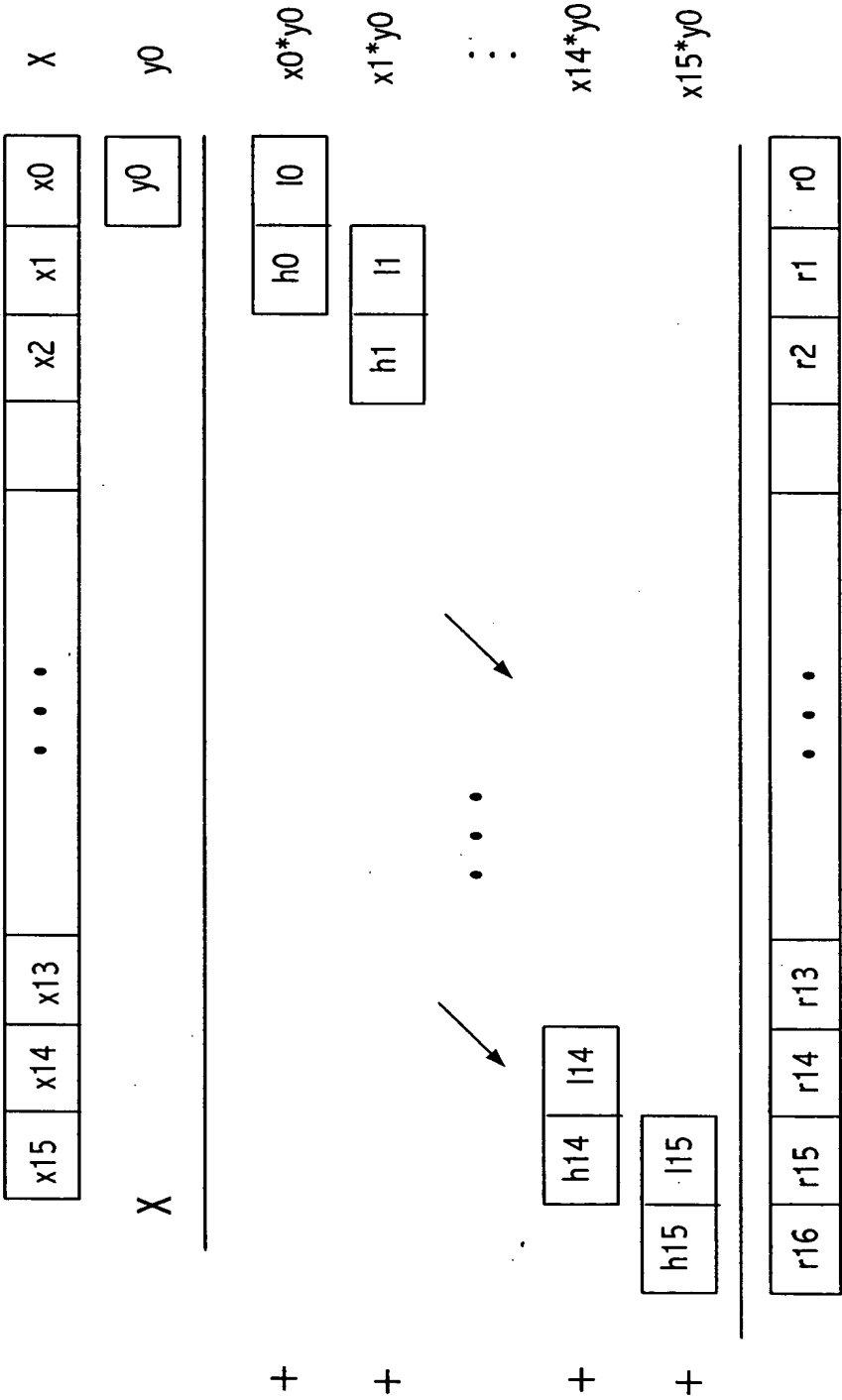


FIG. 3

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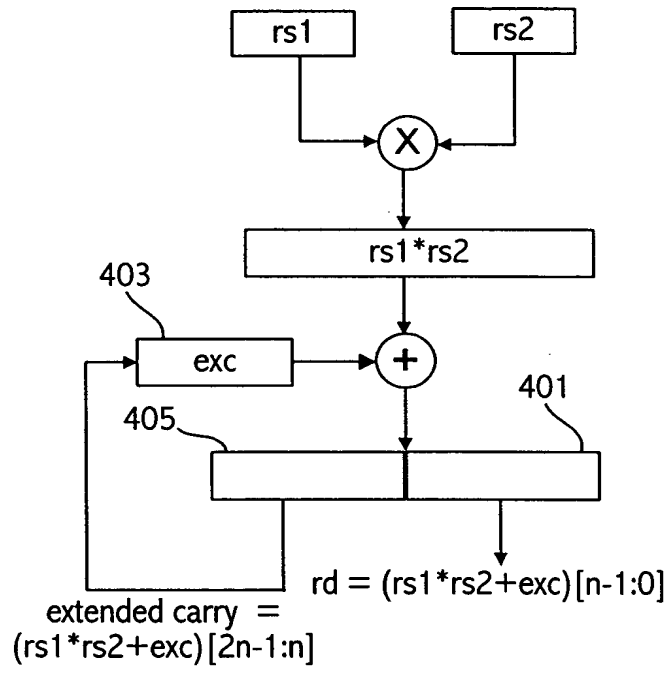


FIG. 4A

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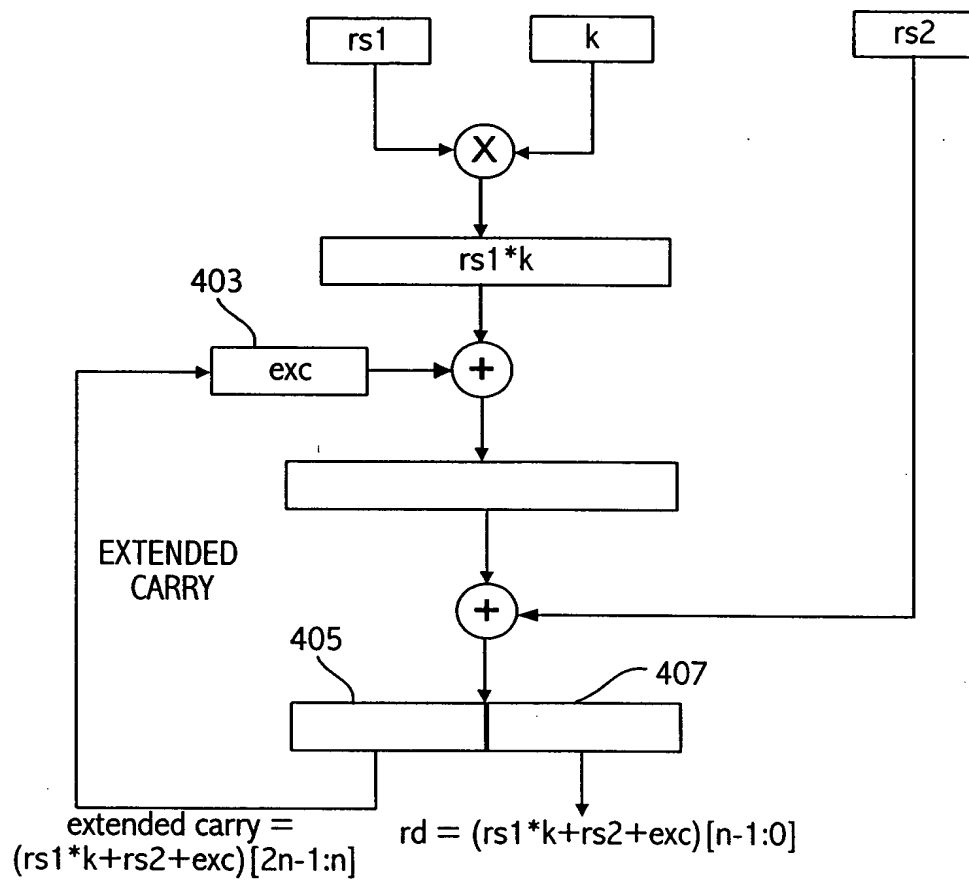


FIG. 4B

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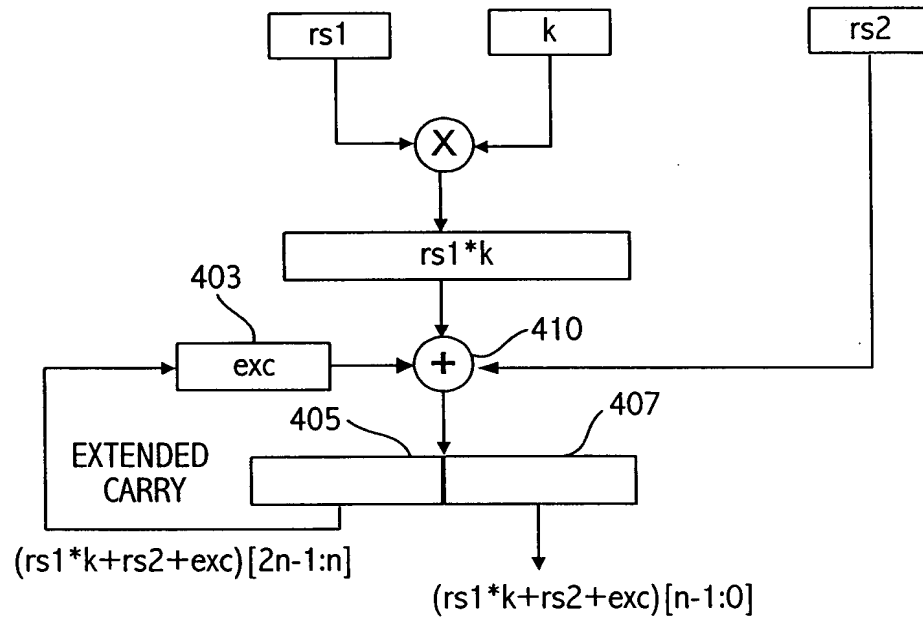


FIG. 4C

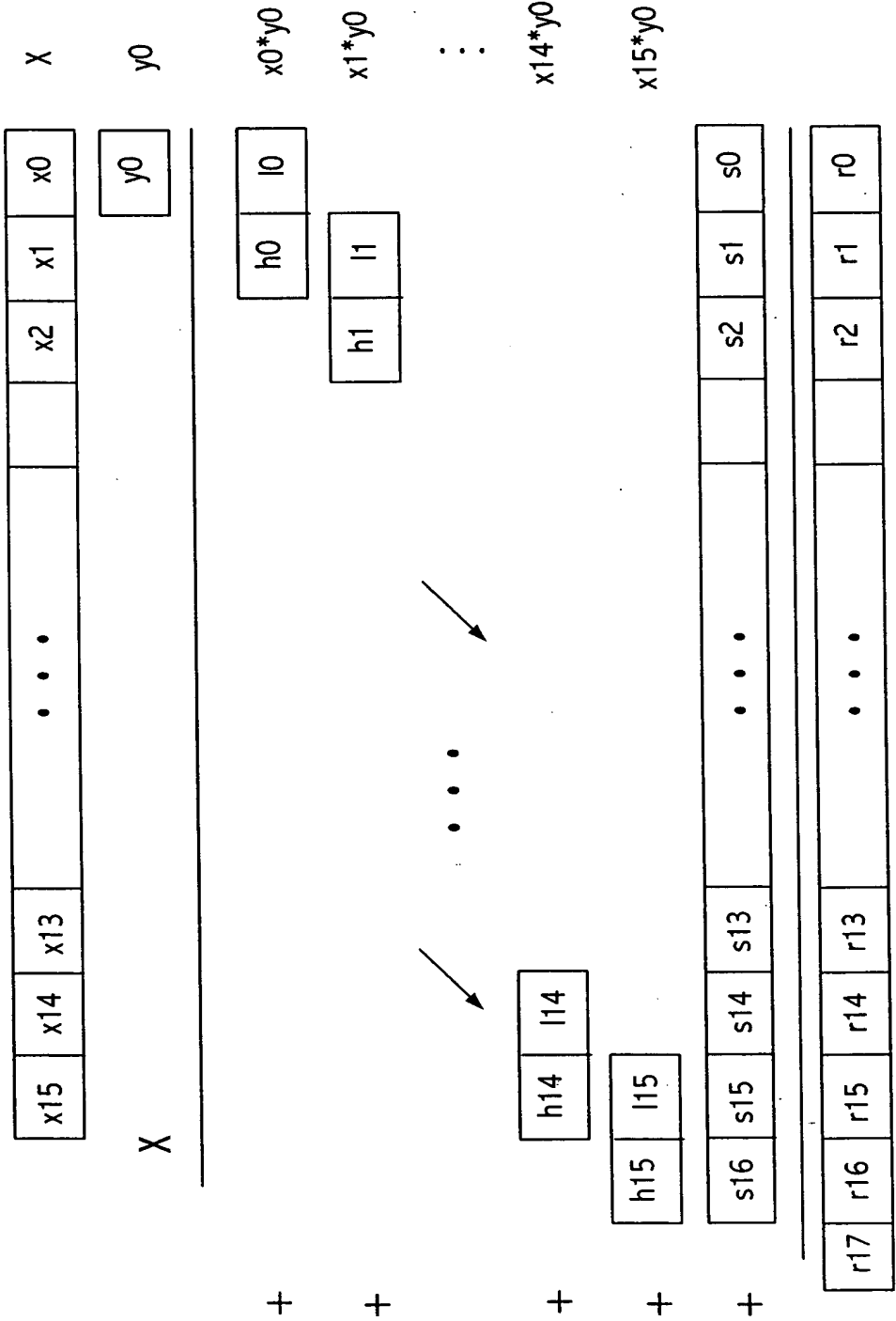


FIG. 5

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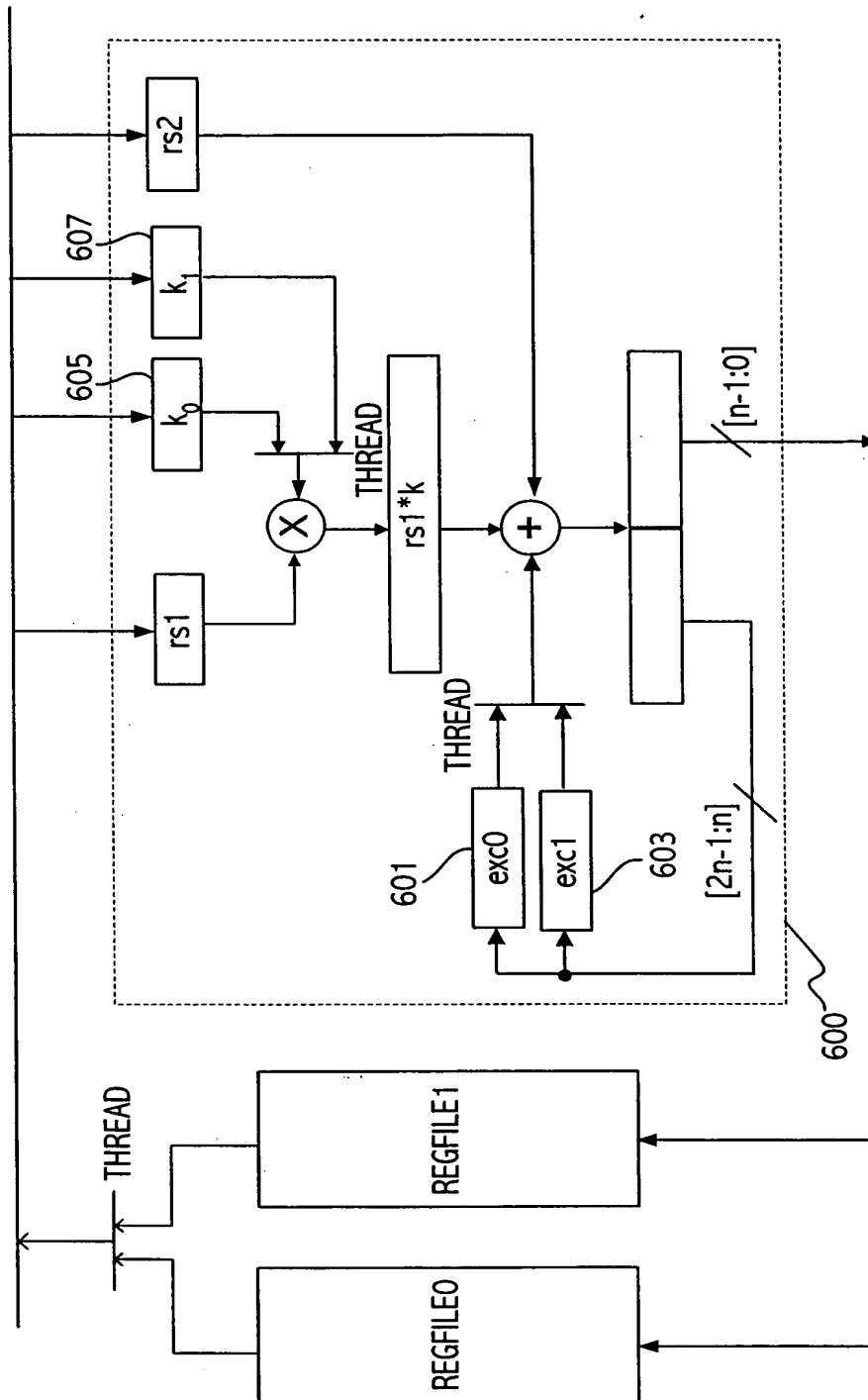


FIG. 6

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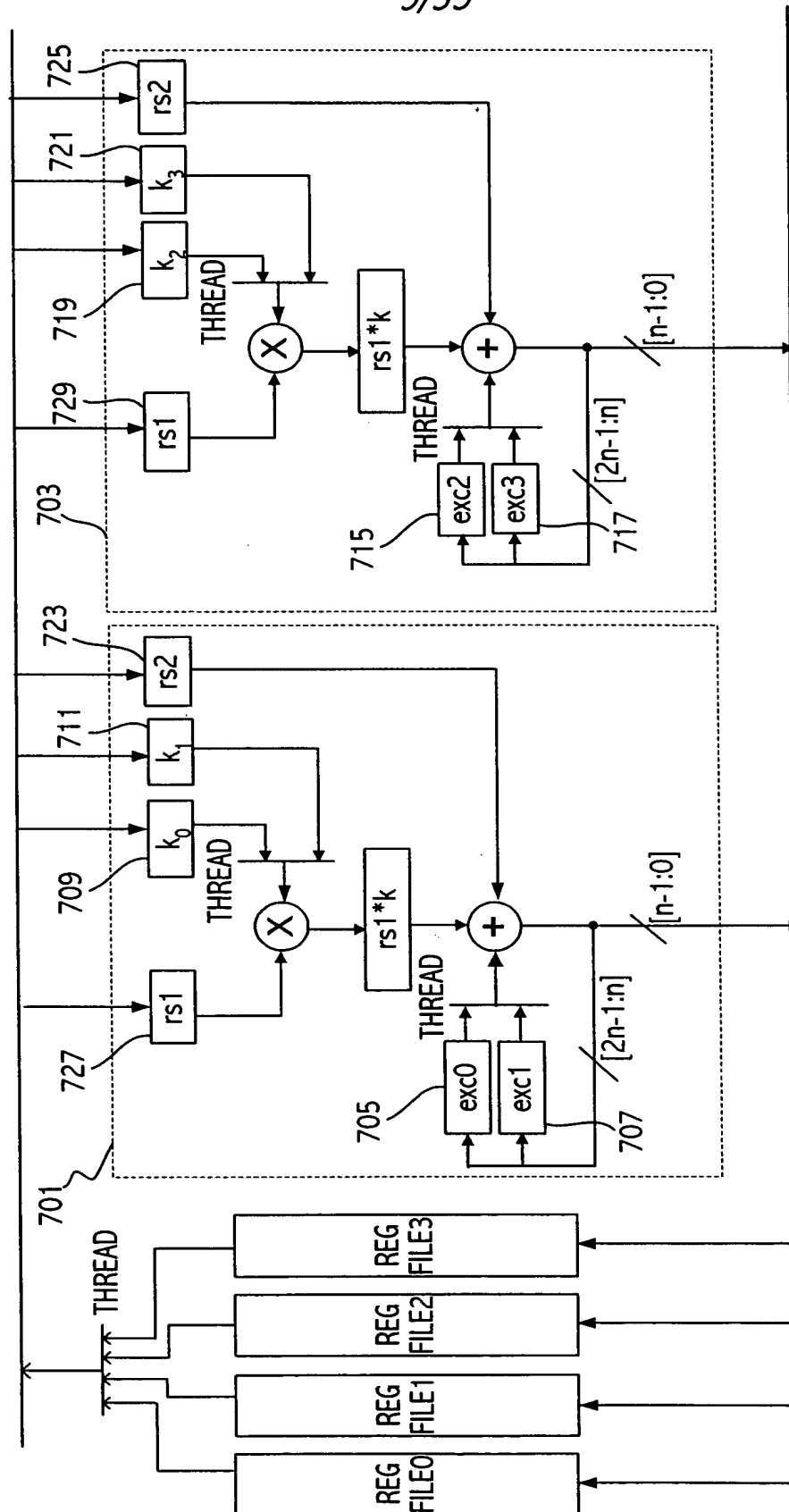


FIG 7

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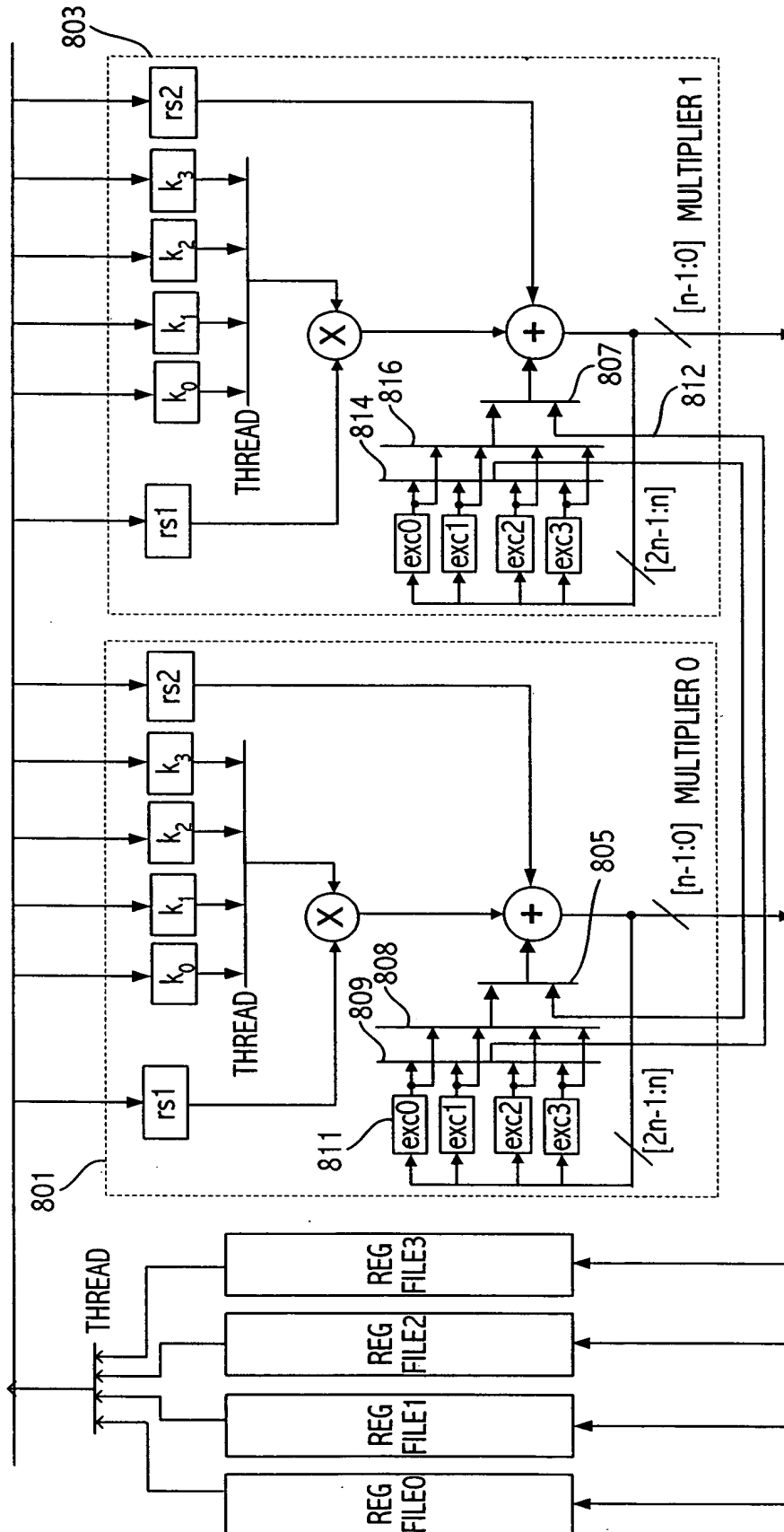


FIG. 8

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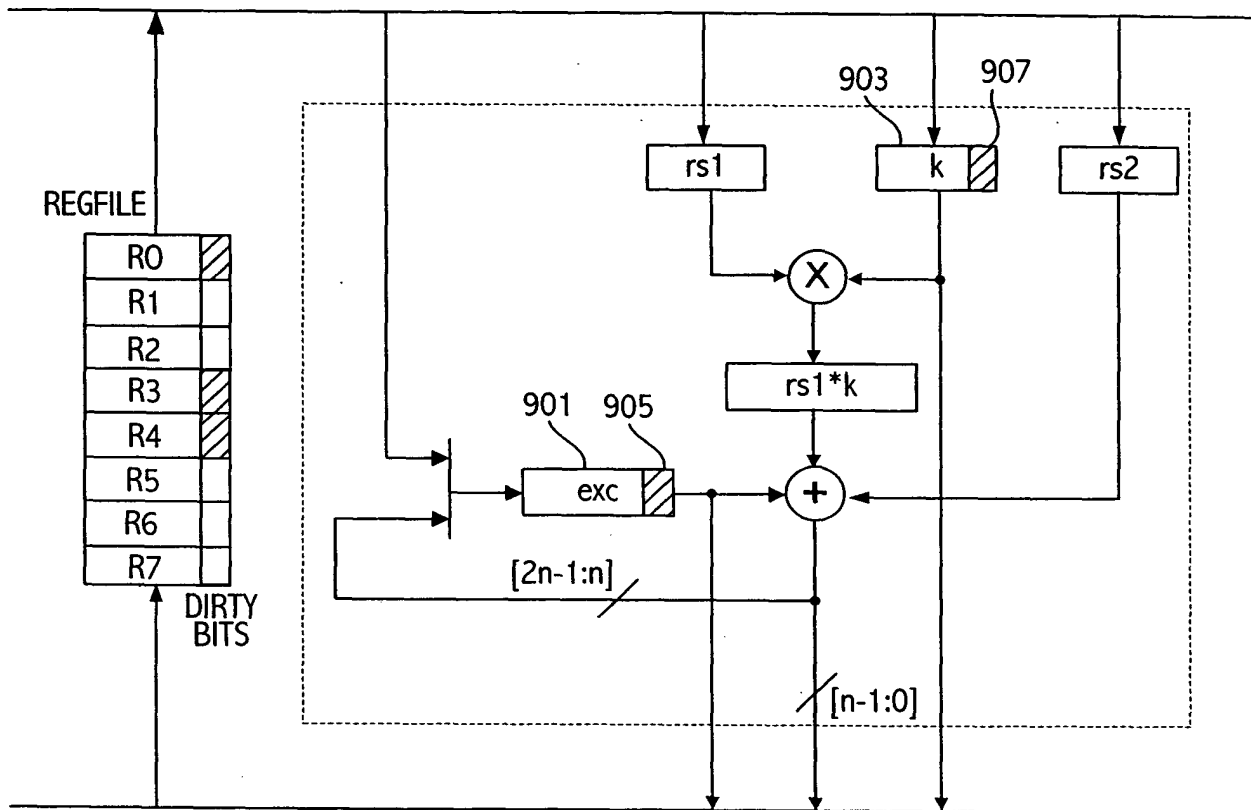


FIG. 9

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$$\begin{array}{r}
 X3 \quad X2 \quad X1 \quad X0 * Y3 \quad Y2 \quad Y1 \quad Y0 + EX3 EX2 EX1 EX0 \\
 \quad \quad \quad P03 P02 P01 P00 \quad \quad \quad P_{ij} \\
 + \quad \quad \quad P13 P12 P11 P10 \quad \quad \quad = X_i * Y_j \\
 + \quad \quad \quad P23 P22 P21 P20 \\
 + \quad \quad \quad P33 P32 P31 P30 \\
 + \quad \quad \quad EX3 EX2 EX1 EX0 \\
 \hline
 = \quad S6 \quad S5 \quad S4 \quad S3 \quad S2 \quad S1 \quad S0 \\
 + C7 \quad C6 \quad C5 \quad C4 \quad C3 \quad C2 \quad C1 \\
 \hline
 EX3 EX2 EX1 EX0 rd3 rd2 rd1 rd0
 \end{array}$$

FIG. 10

$$\begin{array}{r}
 X3 \quad X2 \quad X1 \quad X0 * Y3 \quad Y2 \quad Y1 \quad Y0 + (0, S6, S5, S4) + (C7, C6, C5, C4) + (0, 0, 0, CC4) \\
 \quad \quad \quad P03 P02 P01 P00 \quad \left. \begin{array}{l} + \\ + \\ + \end{array} \right\} \text{INPUTS AT START OF WALLACE TREE} \quad P_{ij} = X_i * Y_j \\
 \quad \quad \quad P13 P12 P11 P10 \\
 \quad \quad \quad P23 P22 P21 P20 \\
 \quad \quad \quad P33 P32 P31 P30 \\
 + \quad \quad \quad S6 \quad S5 \quad S4 \quad \leftarrow \text{PREVIOUS SUM OUTPUT} \\
 + \quad \quad \quad C7 \quad C6 \quad C5 \quad C4 \quad \leftarrow \text{PREVIOUS CARRY OUTPUT} \quad \left. \begin{array}{l} \\ \\ \end{array} \right\} \text{INPUTS IN MIDDLE OF WALLACE TREE} \\
 = \quad \quad \quad S6 \quad S5 \quad S4 \quad S3 \quad S2 \quad S1 \quad S0 \quad \left. \begin{array}{l} \\ \\ \end{array} \right\} \text{NEW WALLACE TREE SUM OUTPUT} \\
 + C7 \quad C6 \quad C5 \quad C4 \quad C3 \quad C2 \quad C1 \quad \left. \begin{array}{l} \\ \\ \end{array} \right\} \text{NEW WALLACE TREE CARRY OUTPUT}
 \end{array}$$

FIG. 11

$$\begin{array}{r}
 \quad \quad \quad S3 \quad S2 \quad S1 \quad S0 \\
 + \quad \quad \quad C3 \quad C2 \quad C1 \\
 + \quad \quad \quad \quad \quad \quad CC4 \quad \leftarrow \text{PREVIOUS CLA CARRY OUT} \\
 \hline
 CC4 \quad RD3 \quad RD2 \quad RD1 \quad RD0 \quad \leftarrow \text{NEW CLA OUTPUT}
 \end{array}$$

FIG. 12

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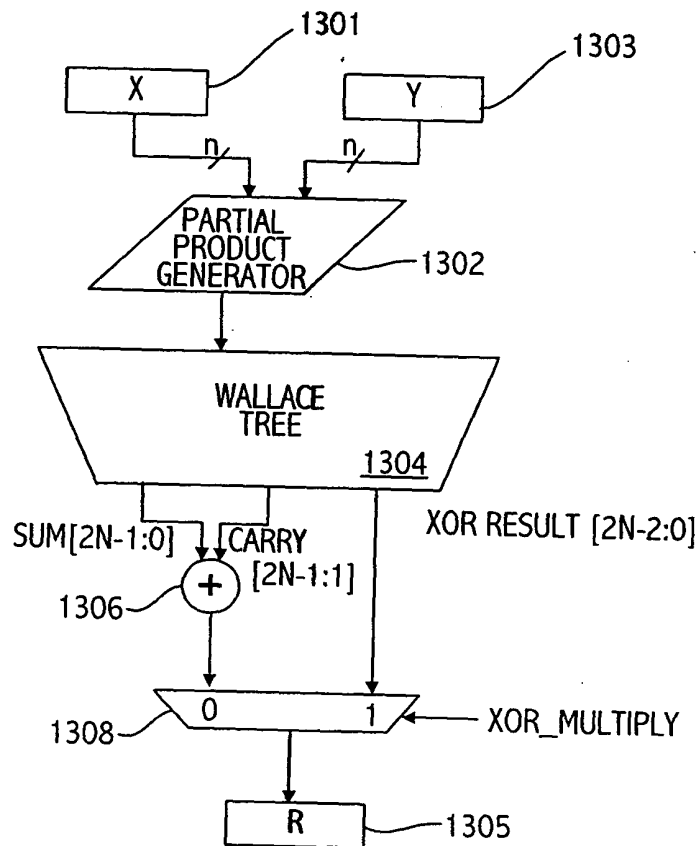


FIG. 13

| | | | | | | | | | | | | | | | | | |
|-------|-----|-----|-----|-----|-----|-------|-----|-----|-----|-----|-----|-----|-----|-----|----|----|----|
| | | | | | | ~SD | SD | SD | D8 | D7 | D6 | D5 | D4 | D3 | D2 | D1 | D0 |
| | | | | | | 1 ~SE | E8 | E7 | E6 | E5 | E4 | E3 | E2 | E1 | E0 | | SD |
| | | | | | | 1 ~SF | F8 | F7 | F6 | F5 | F4 | F3 | F2 | F1 | F0 | SE | |
| 1 ~SG | G8 | G7 | G6 | G5 | G4 | G3 | G2 | G1 | G0 | | | | | | | | |
| | H7 | H6 | H5 | H4 | H3 | H2 | H1 | H0 | | | | | | | | | |
| | | | | | | | | | S15 | S14 | S13 | S12 | S11 | S10 | S9 | S8 | |
| C16 | C16 | C16 | C16 | C16 | C16 | C16 | C16 | C16 | C15 | C14 | C13 | C12 | C11 | C10 | C9 | C8 | |
| | | | | | | | | | Z7 | Z6 | Z5 | Z4 | Z3 | Z2 | Z1 | Z0 | |
| ----- | | | | | | | | | | | | | | | | | |
| | S15 | S14 | S13 | S12 | S11 | S10 | S9 | S8 | S7 | S6 | S5 | S4 | S3 | S2 | S1 | S0 | |
| C16 | C15 | C14 | C13 | C12 | C11 | C10 | C9 | C8 | C7 | C6 | C5 | C4 | C3 | C2 | C1 | C0 | |

with [S7:S0] and [C7:C0] going to the carry look-ahead adder.

Fig 12 B

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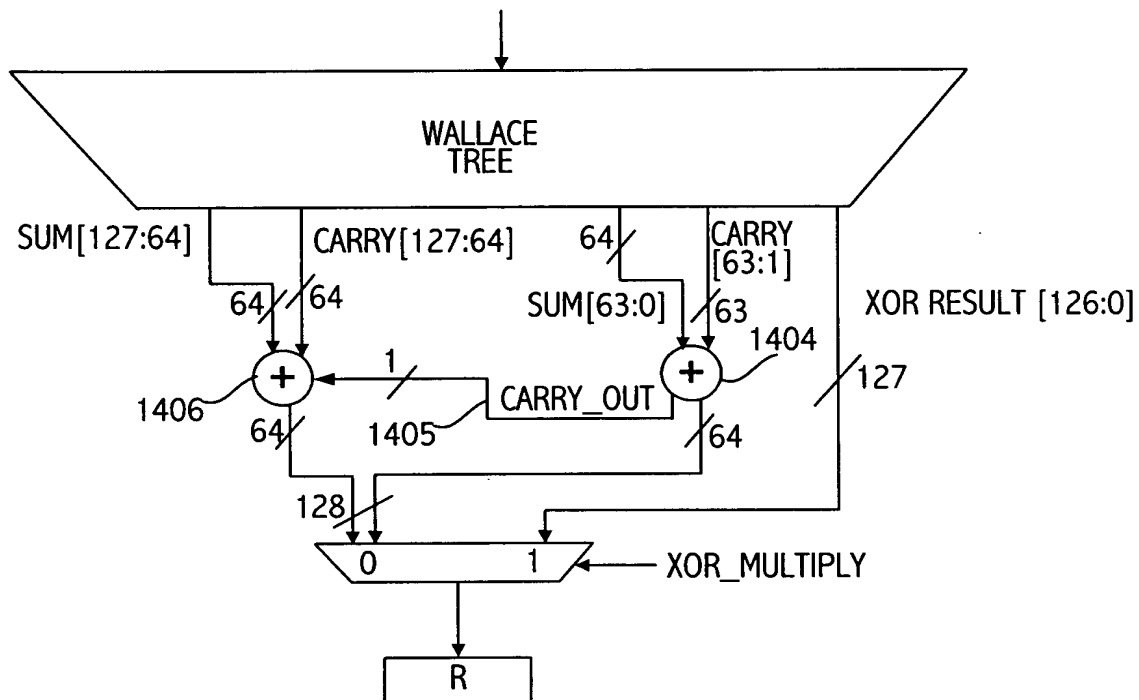


FIG. 14

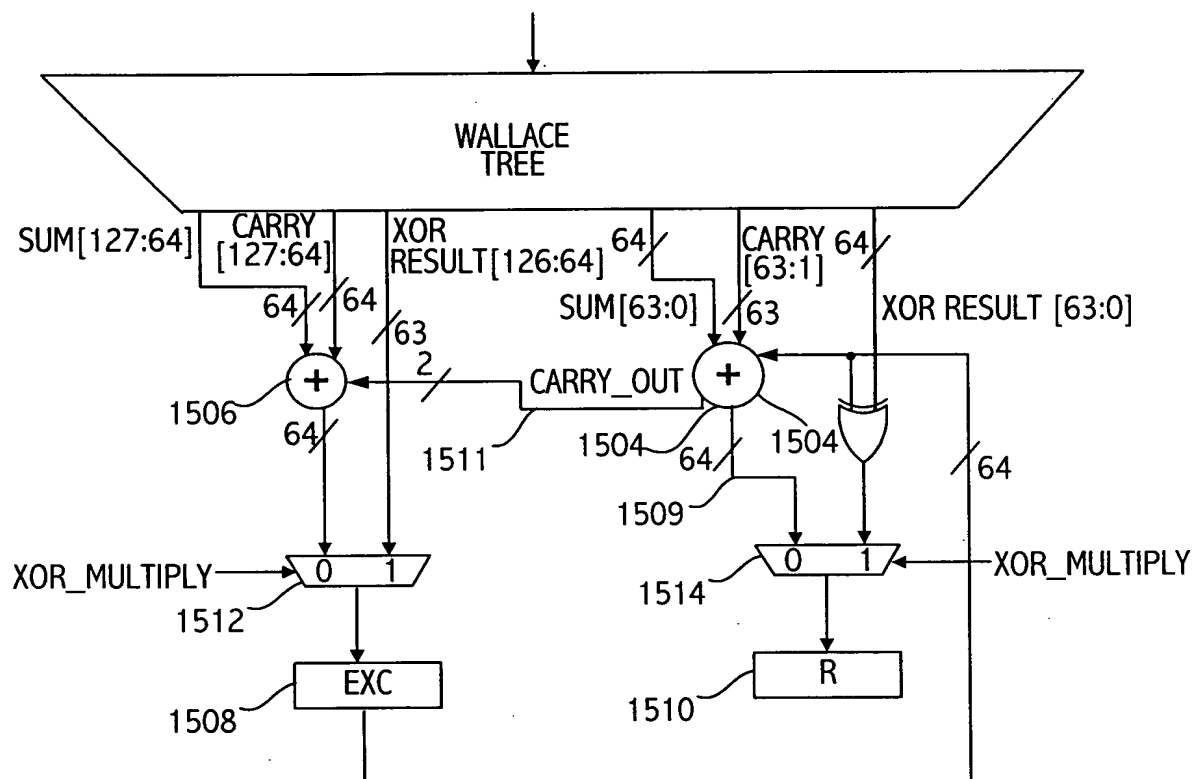


FIG. 15

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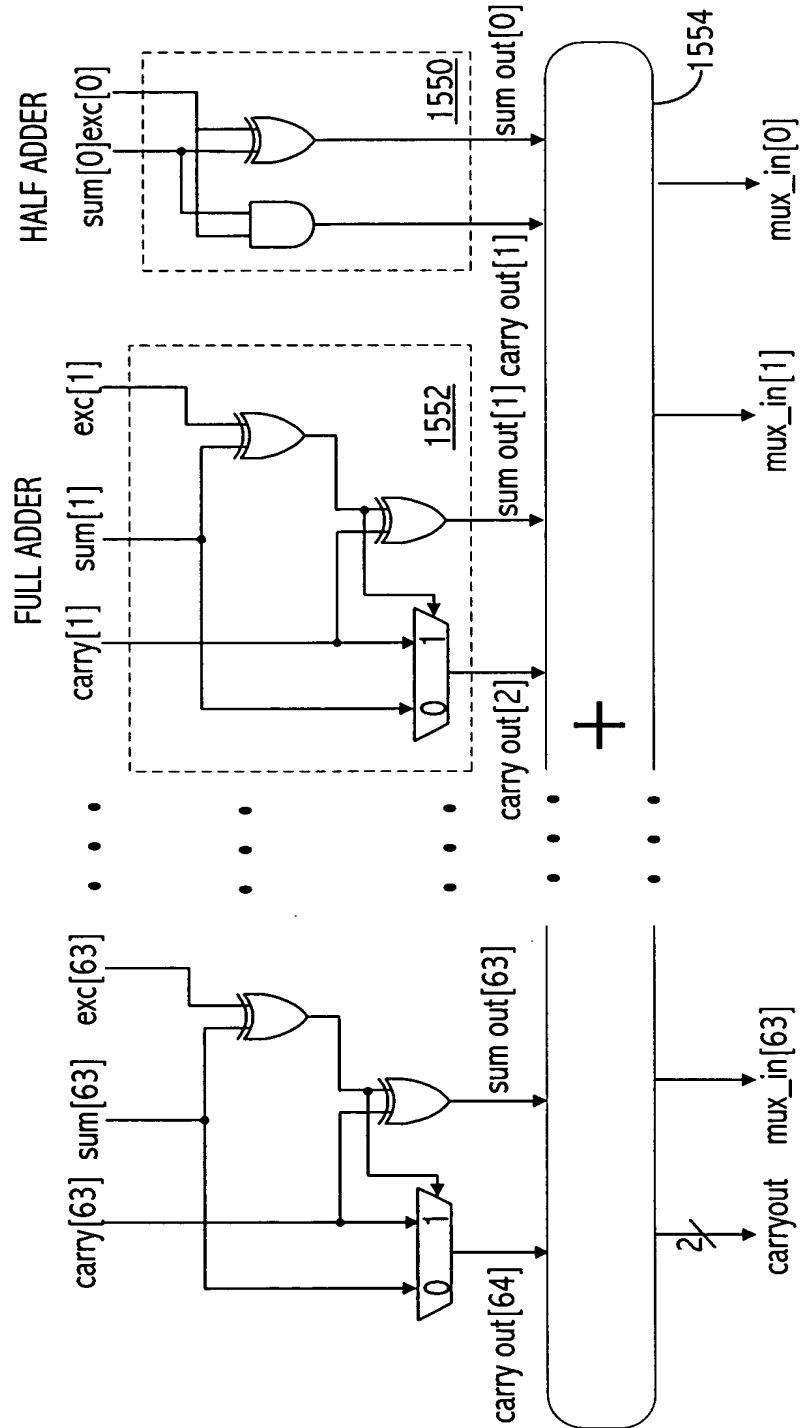


FIG. 15a

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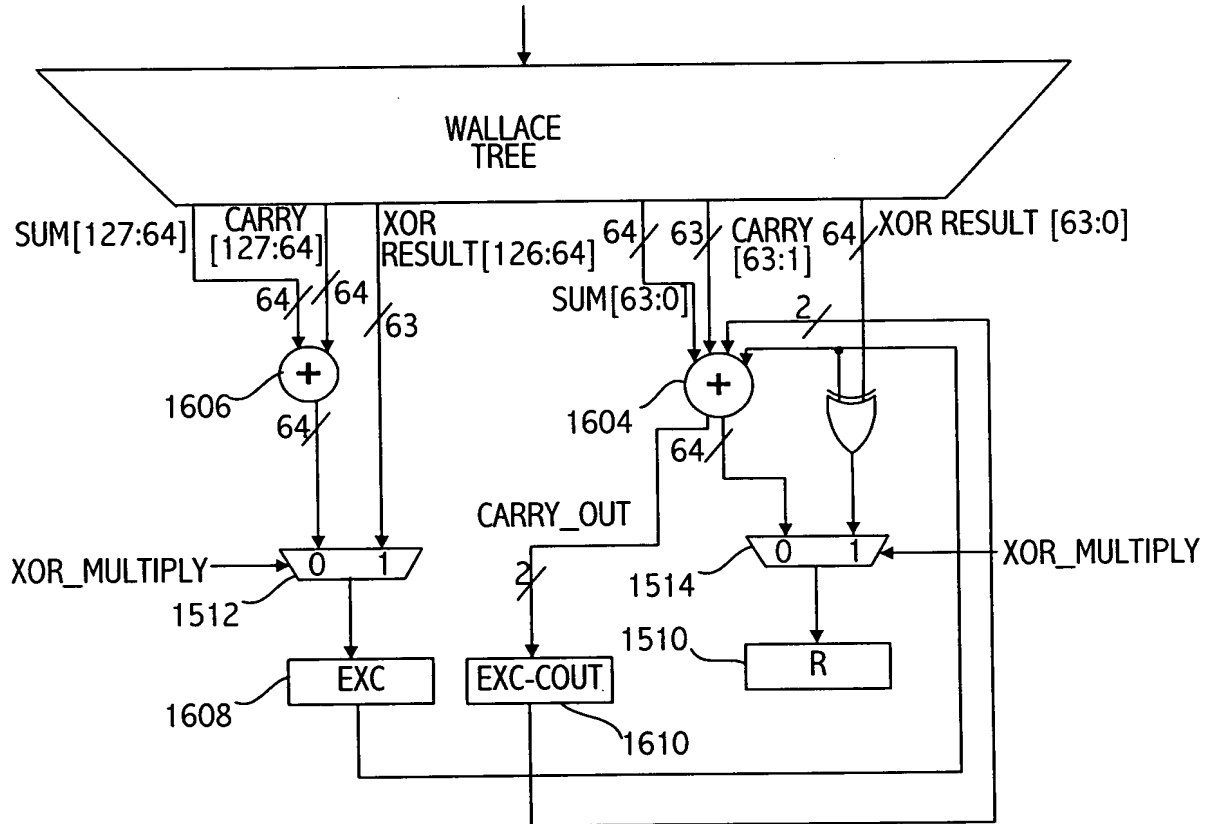


FIG. 16

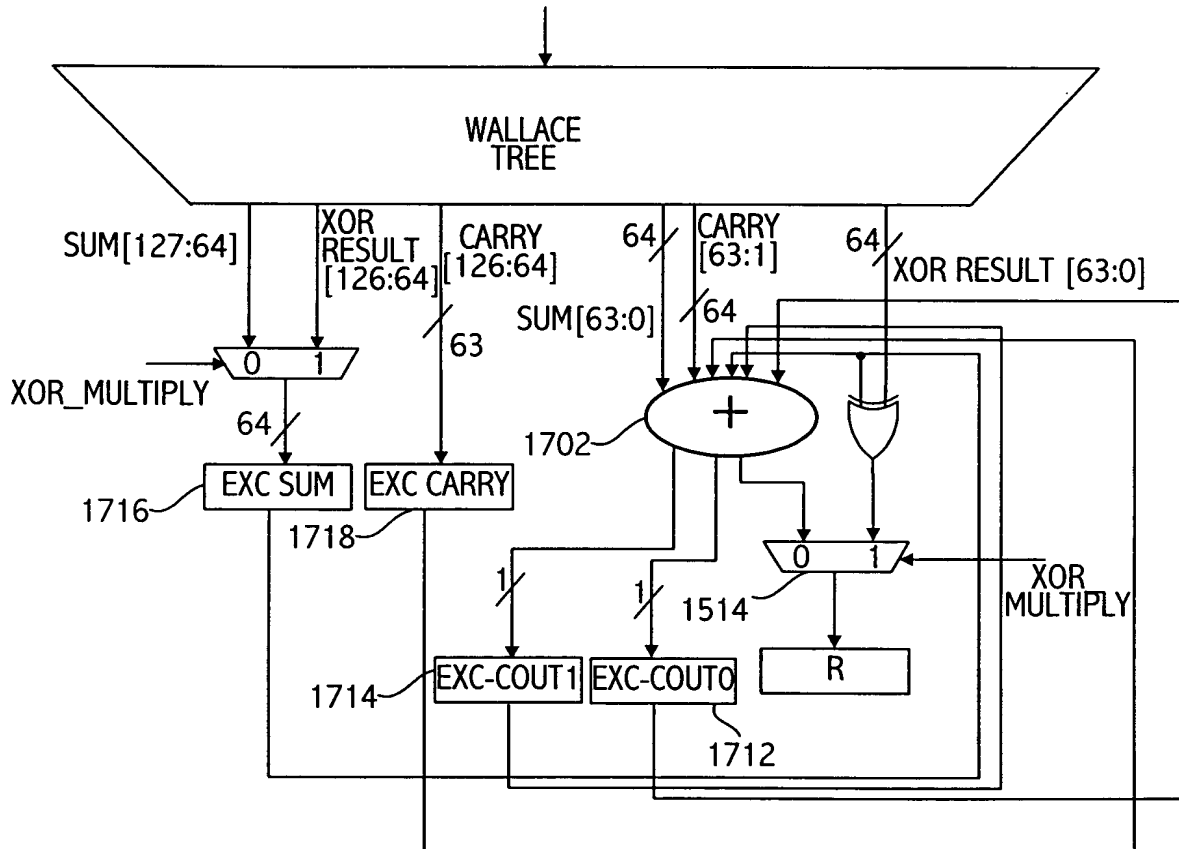


FIG. 17

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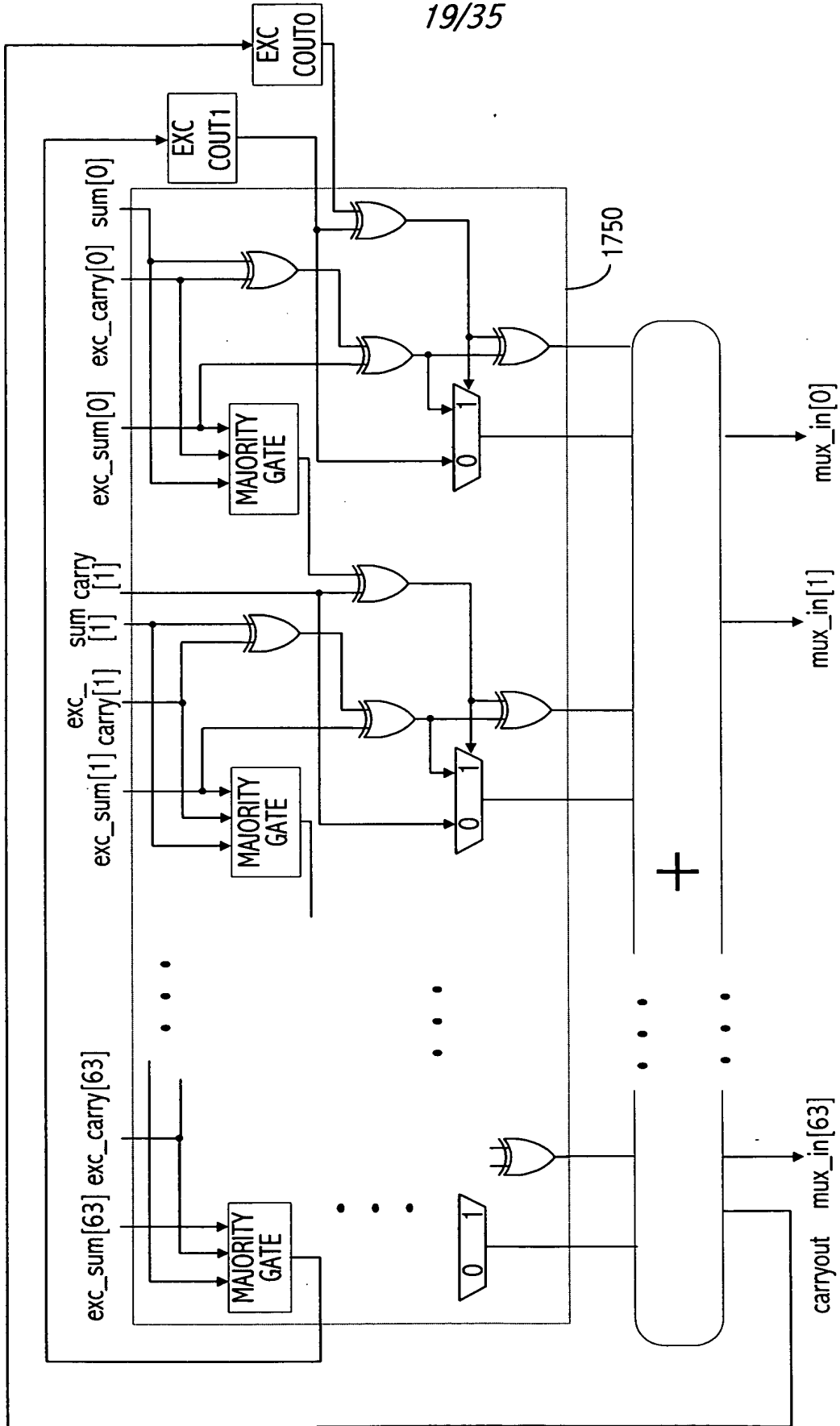


Fig. 17A

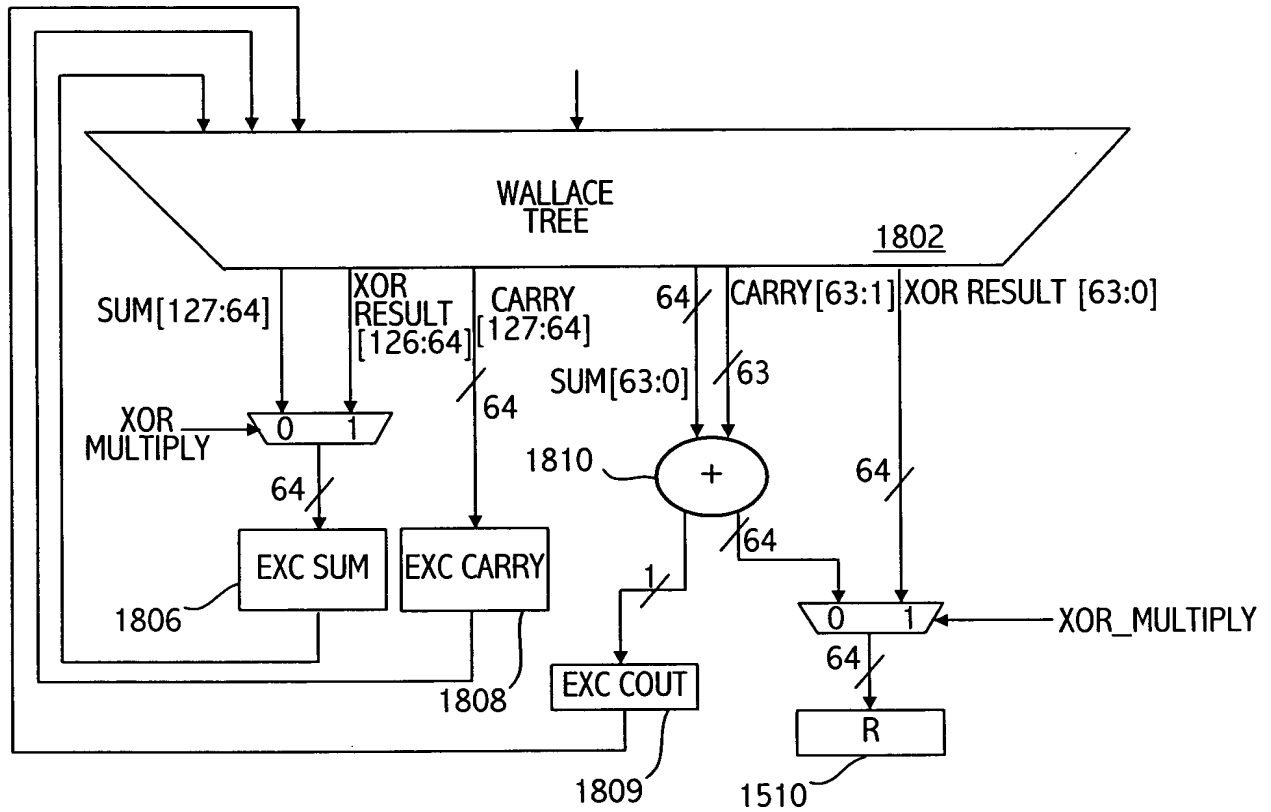


FIG. 18

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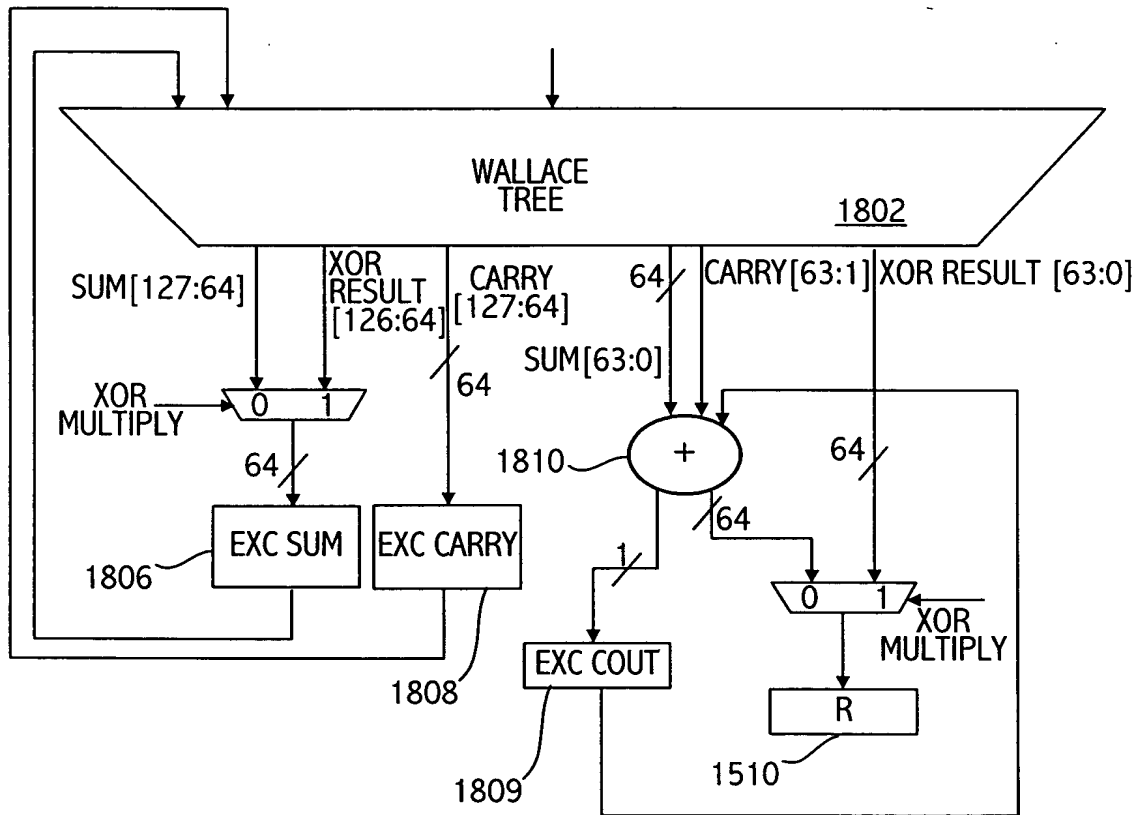


FIG. 19

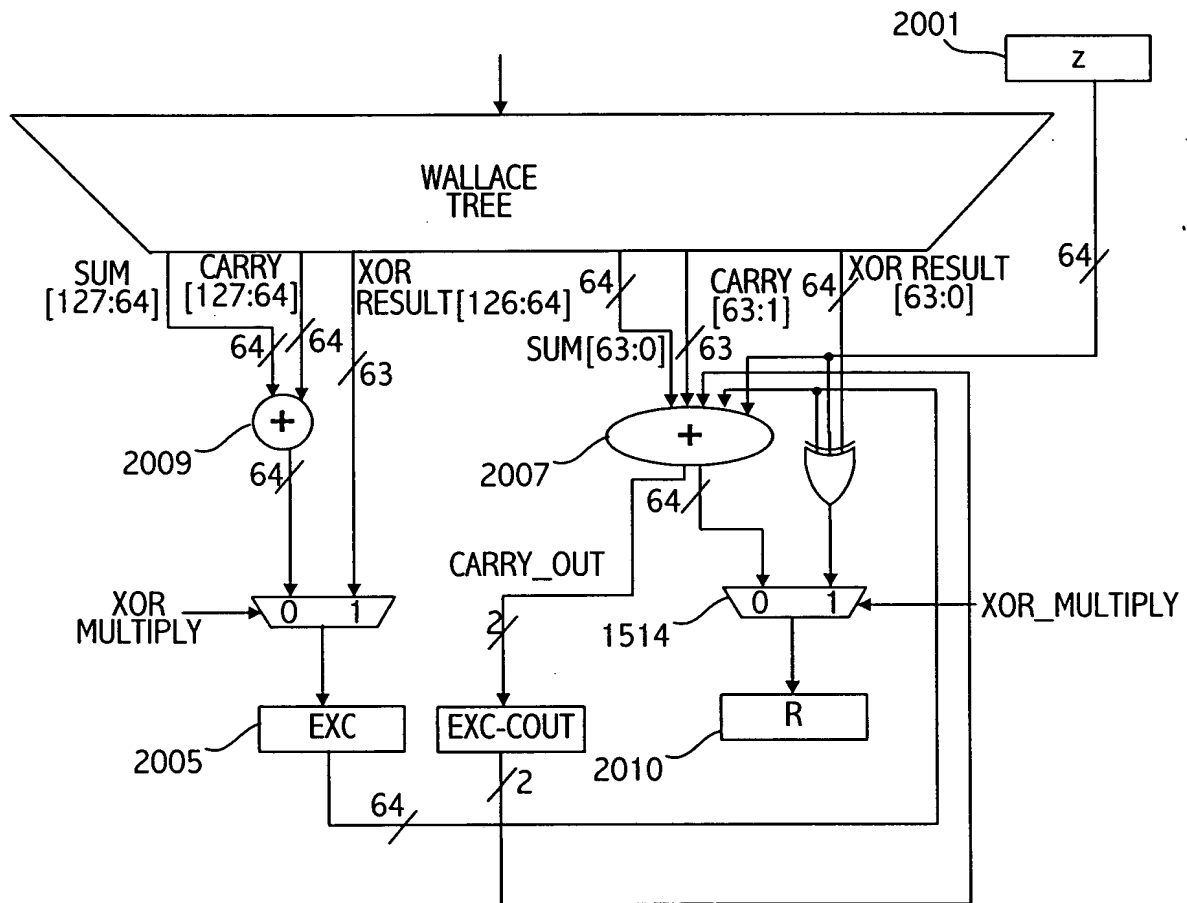


FIG. 20

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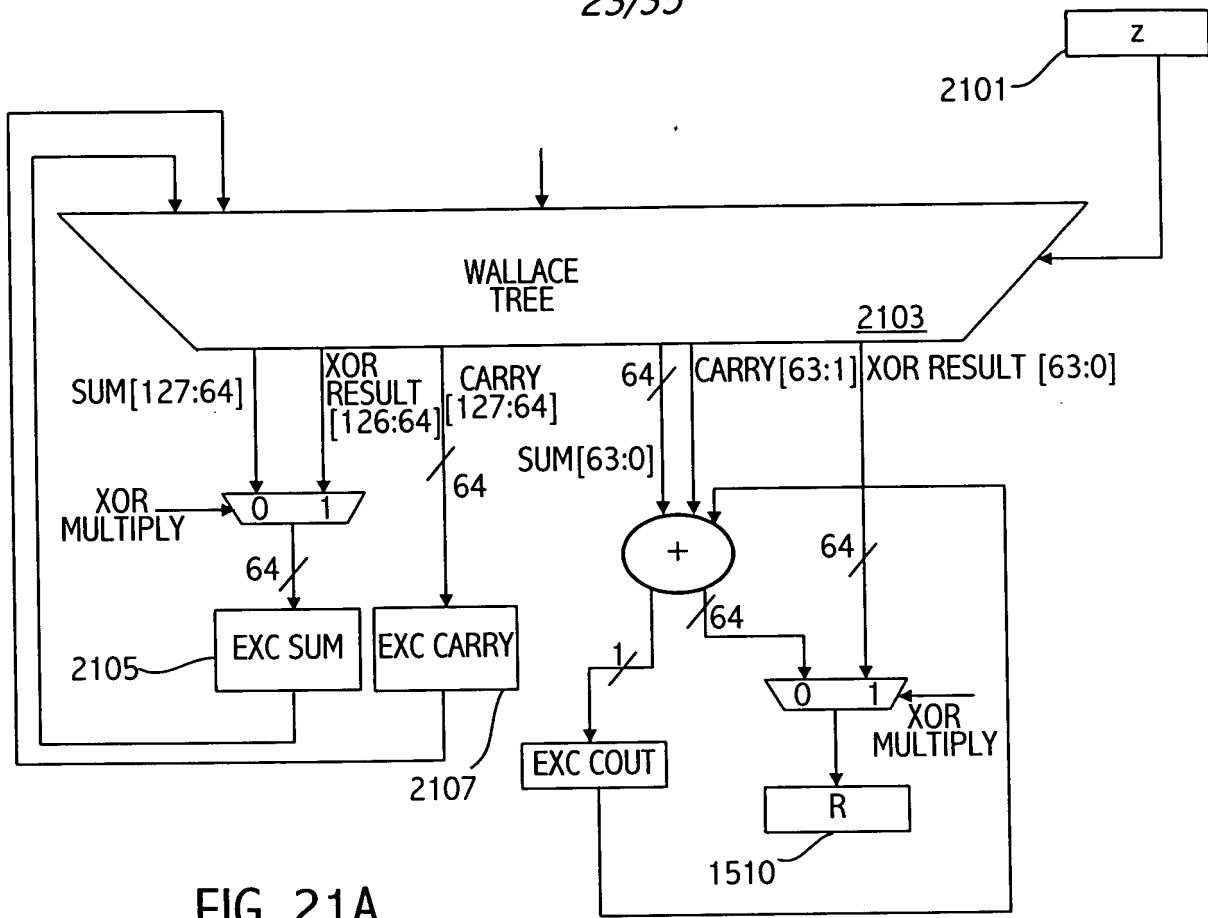


FIG. 21A

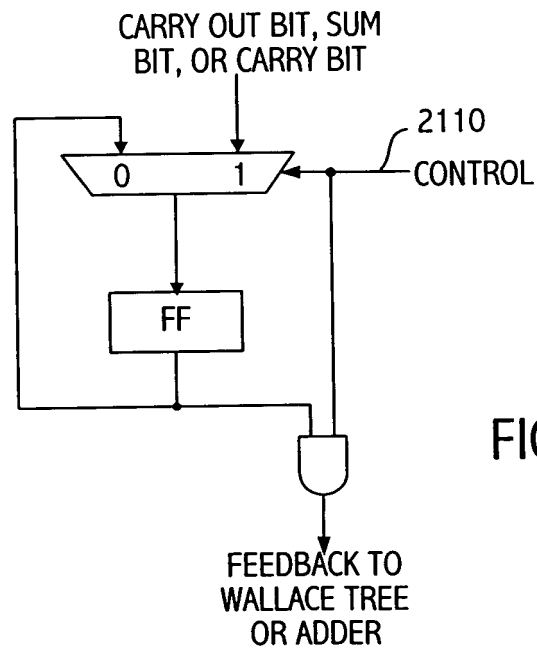


FIG. 21B

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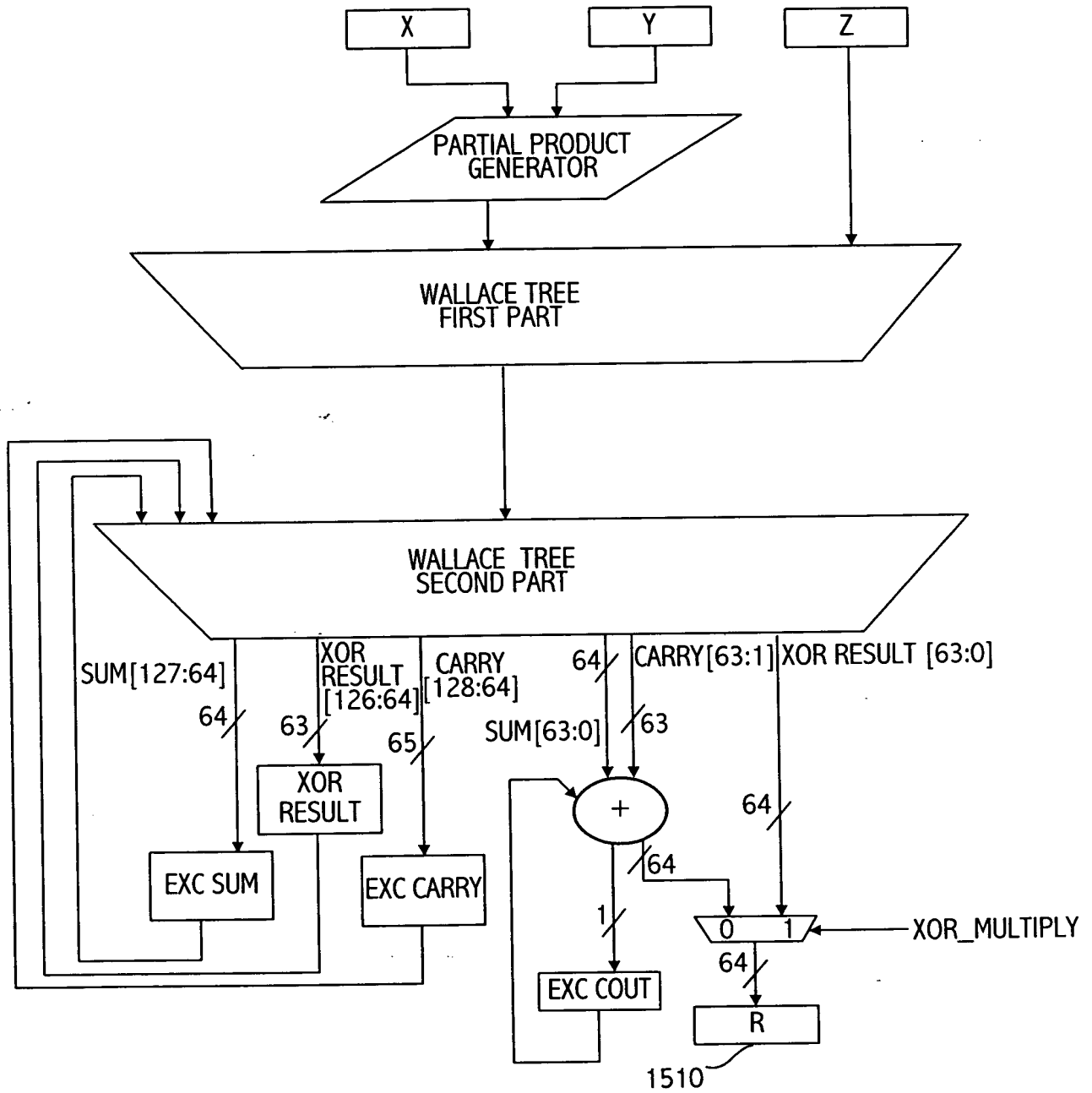
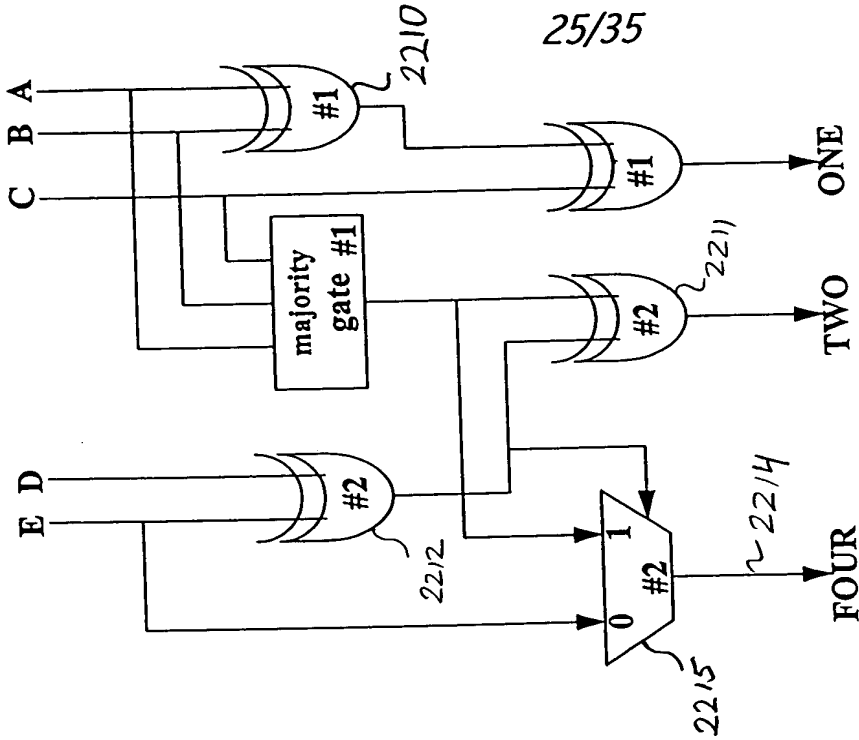


FIG. 21C

5 TO 3 COMPRESSOR

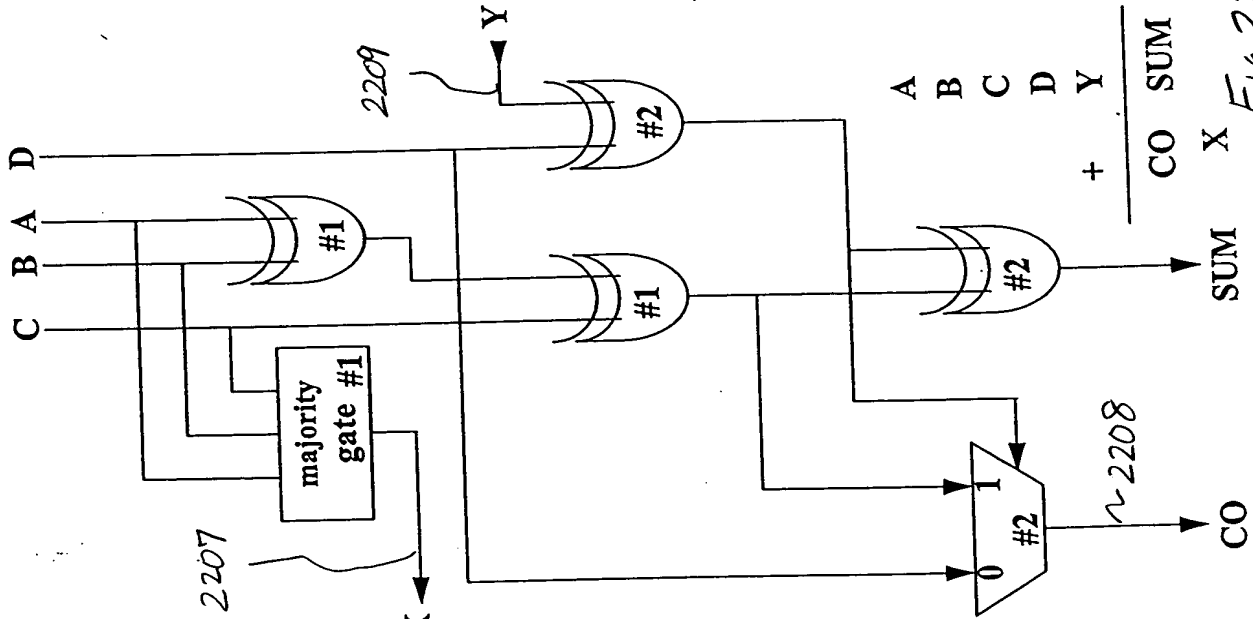


efficiency = 22.5%

$$\begin{array}{r} A \\ D B \\ + E C \\ \hline 4 \ 2 \ 1 \end{array}$$

Fig. 22c

4 TO 2 COMPRESSOR



efficiency = 18.4%

$$\begin{array}{r} A \\ B \\ + CI \\ \hline CO \ SUM \end{array}$$

Fig. 22A

efficiency = 20.6%

Fig. 22B

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MUL
MAJORITY

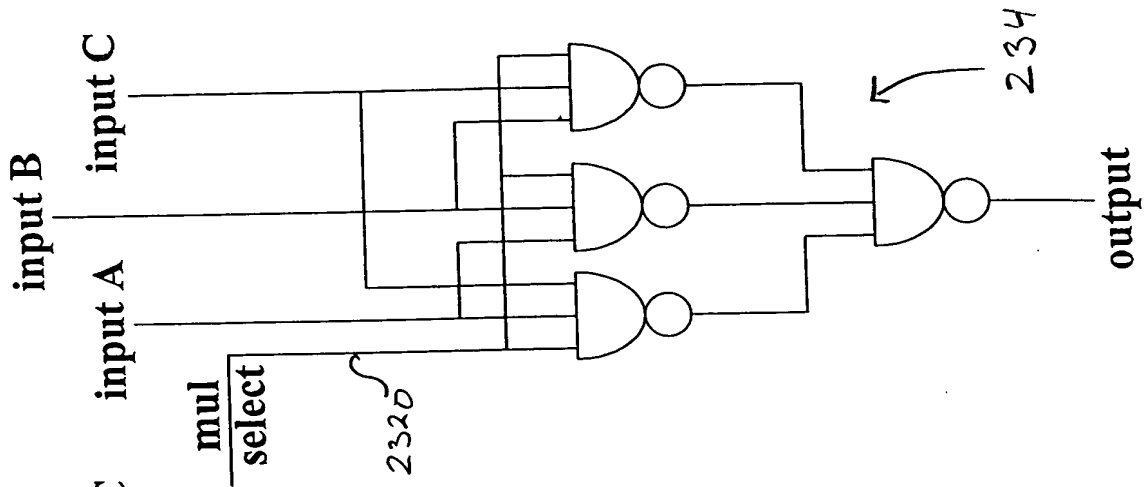


Fig. 23D

MAJORITY

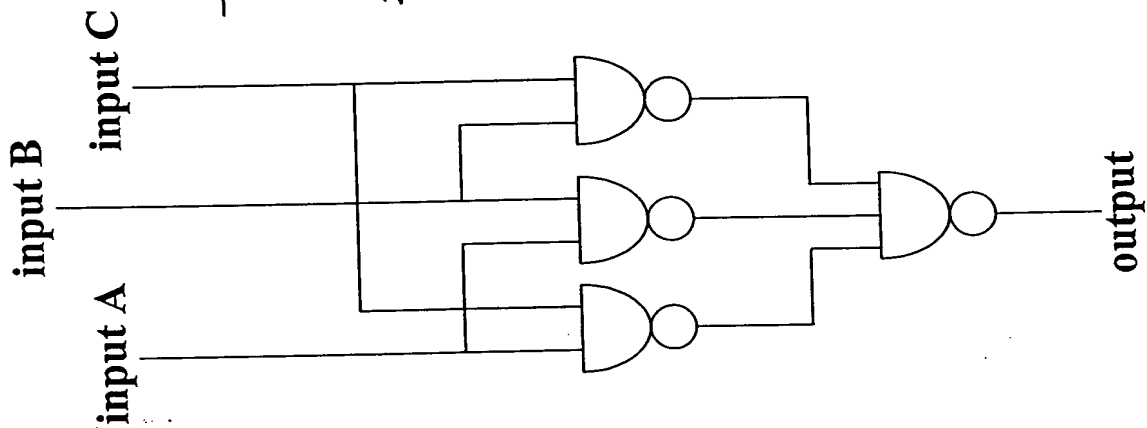


Fig. 23C

MUX

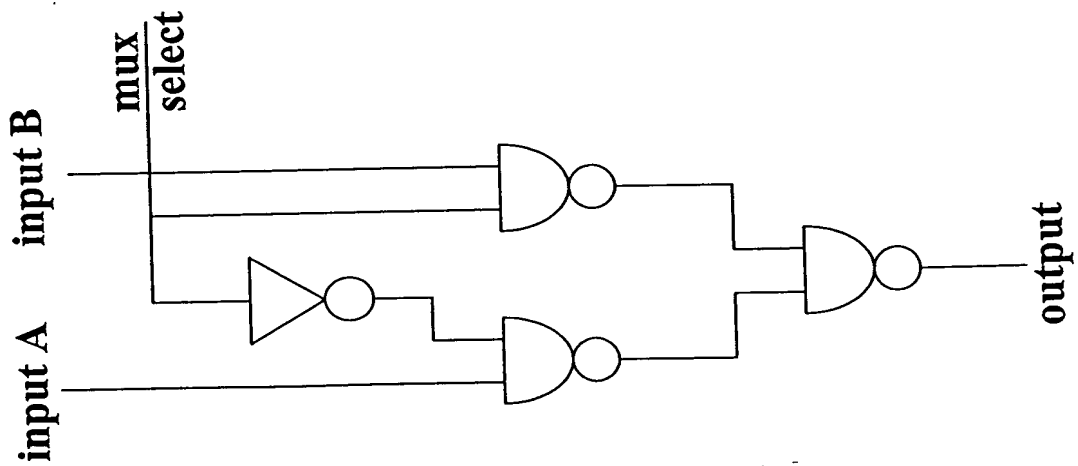


Fig. 23B

XOR

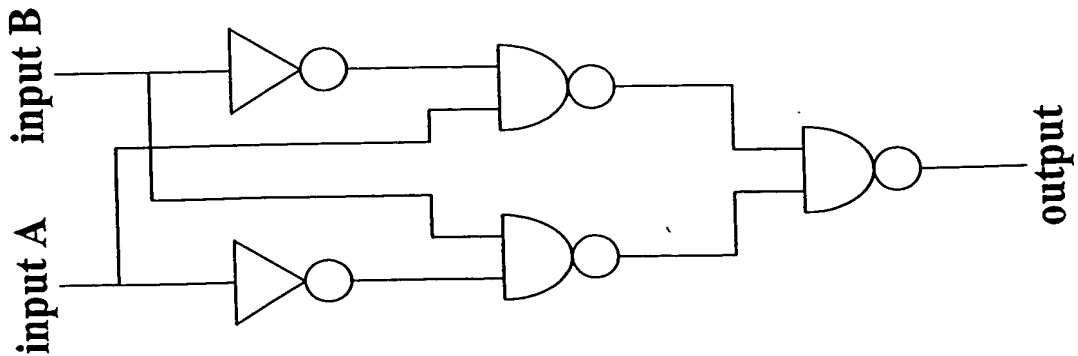


Fig. 23A

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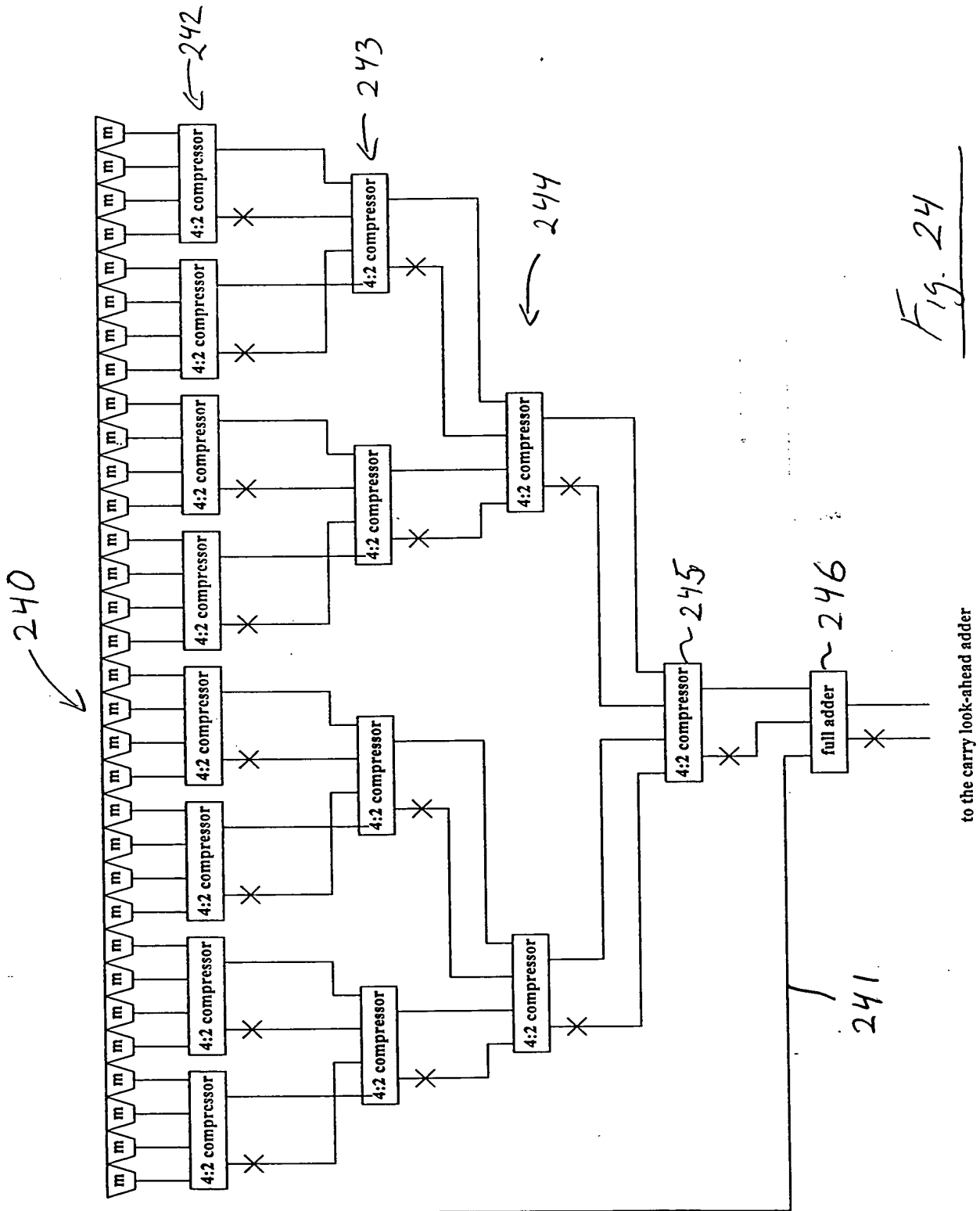
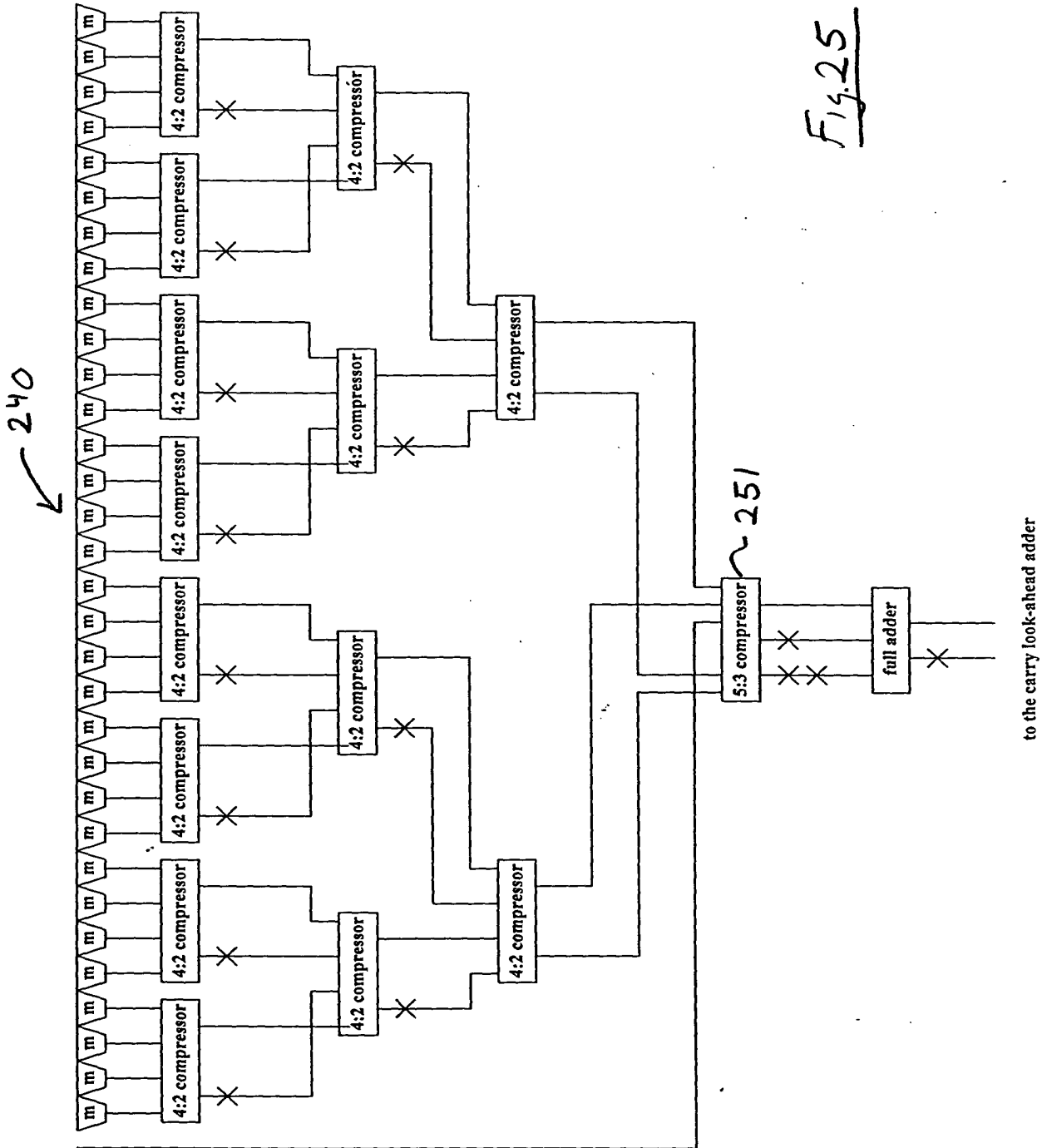
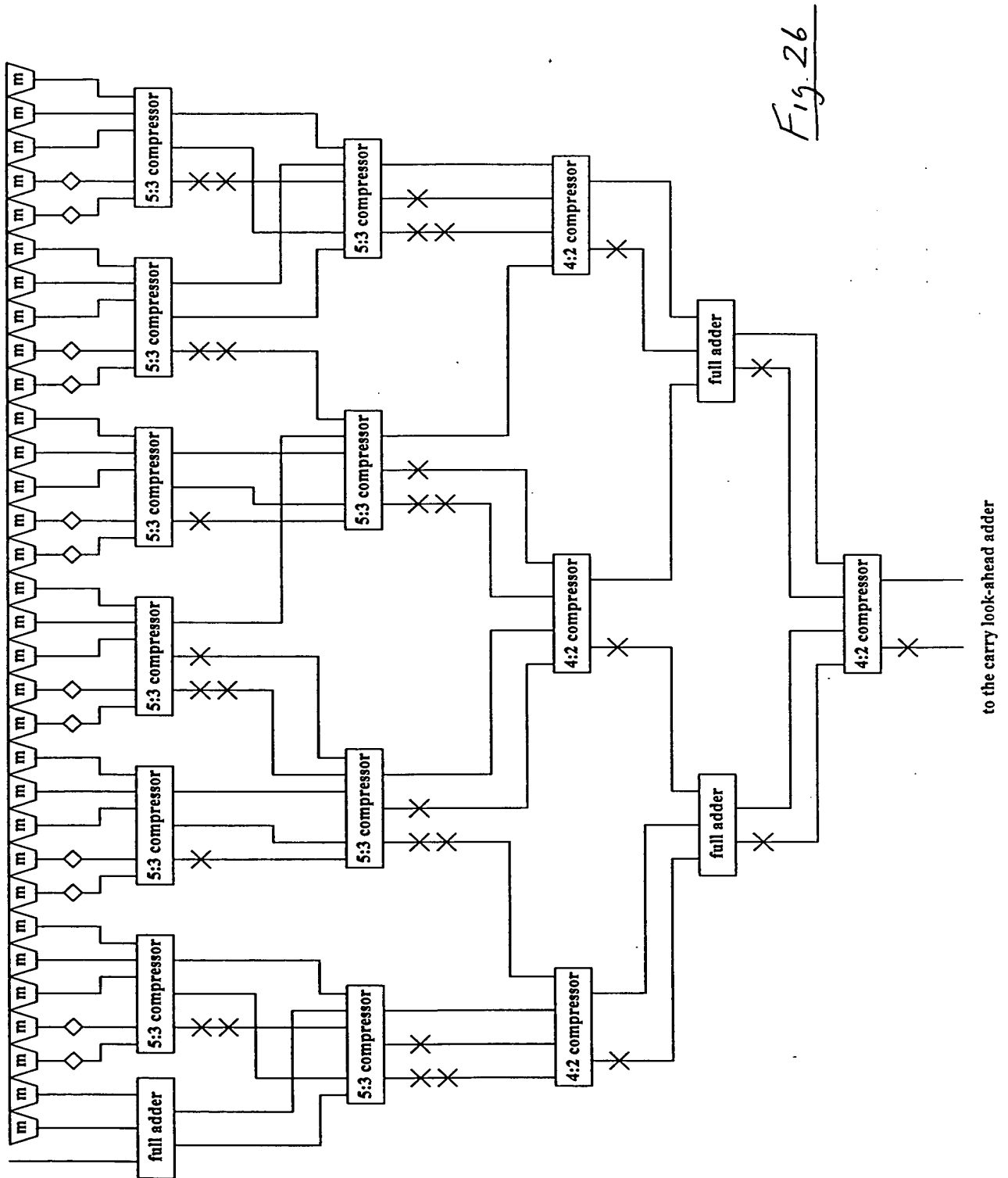


Fig. 24

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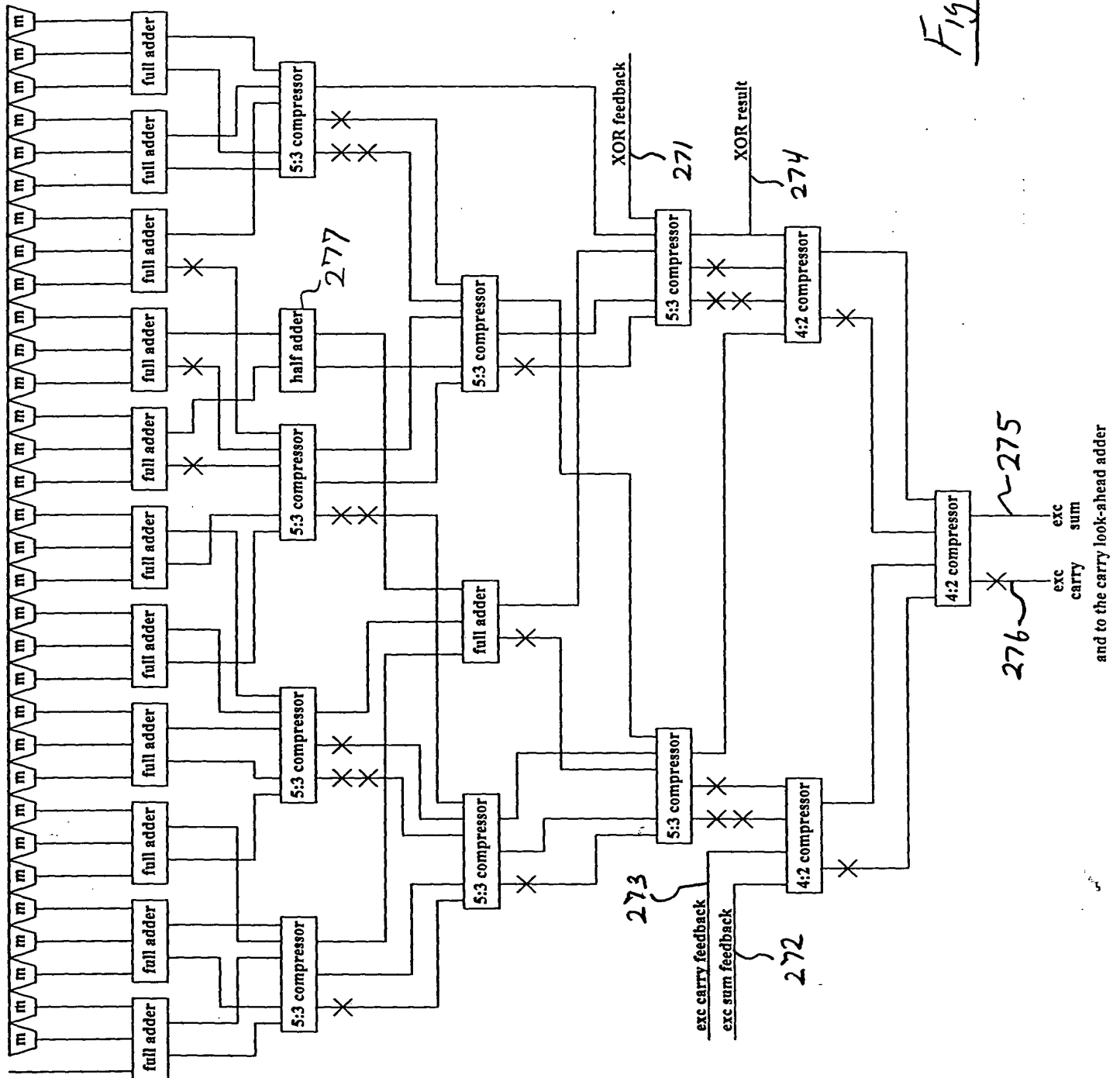


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Fig. 27



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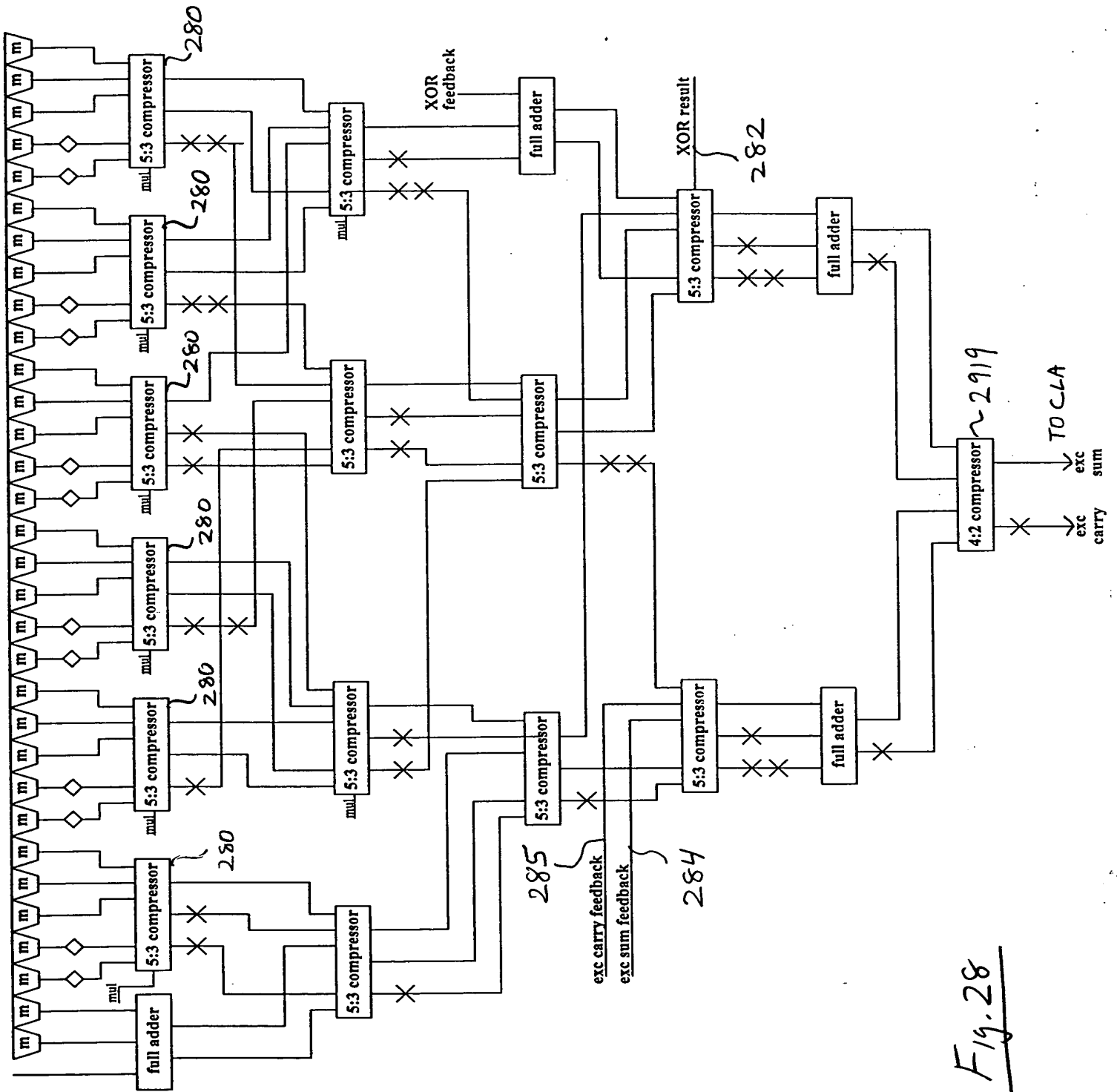


Fig. 28

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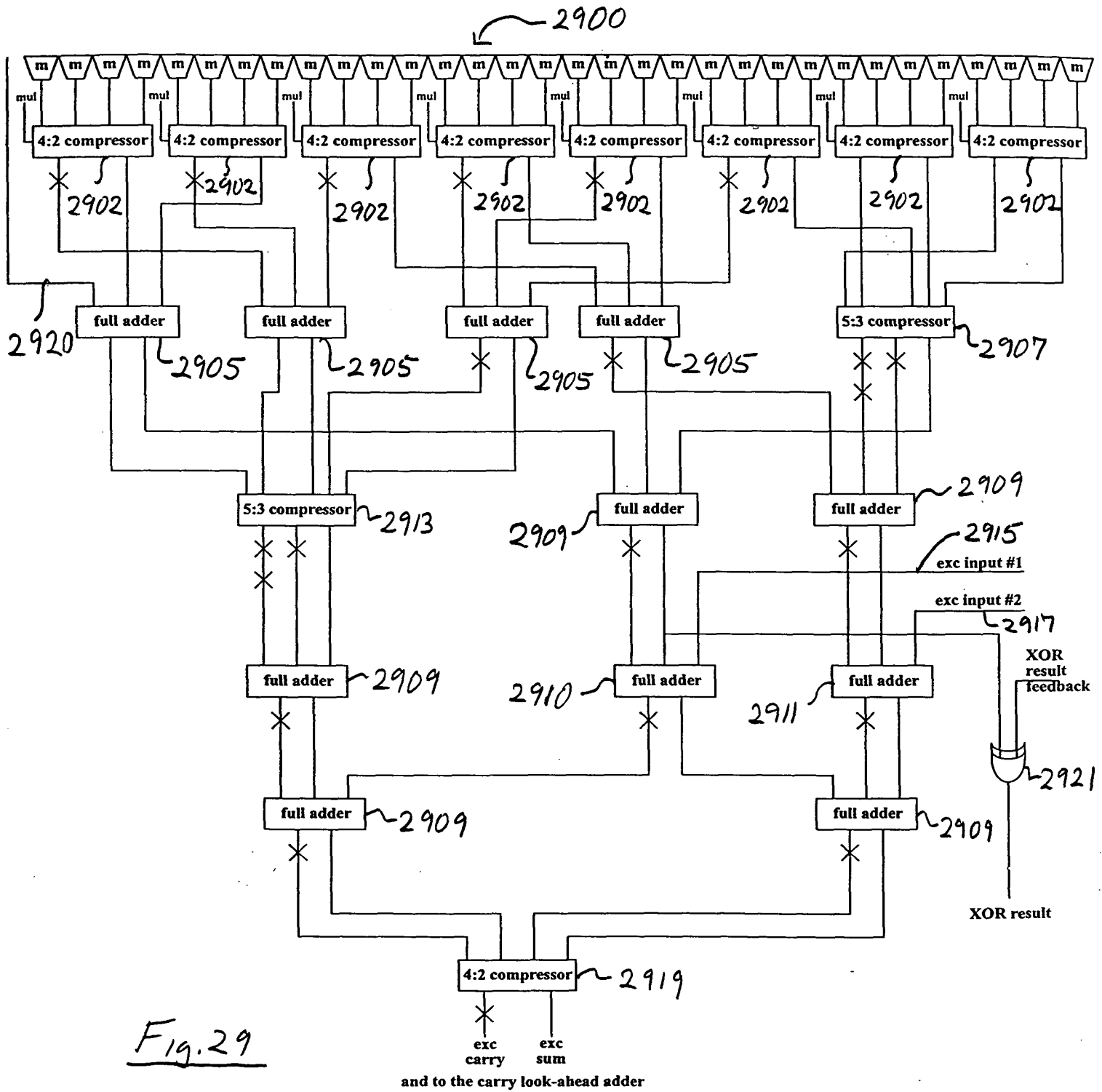
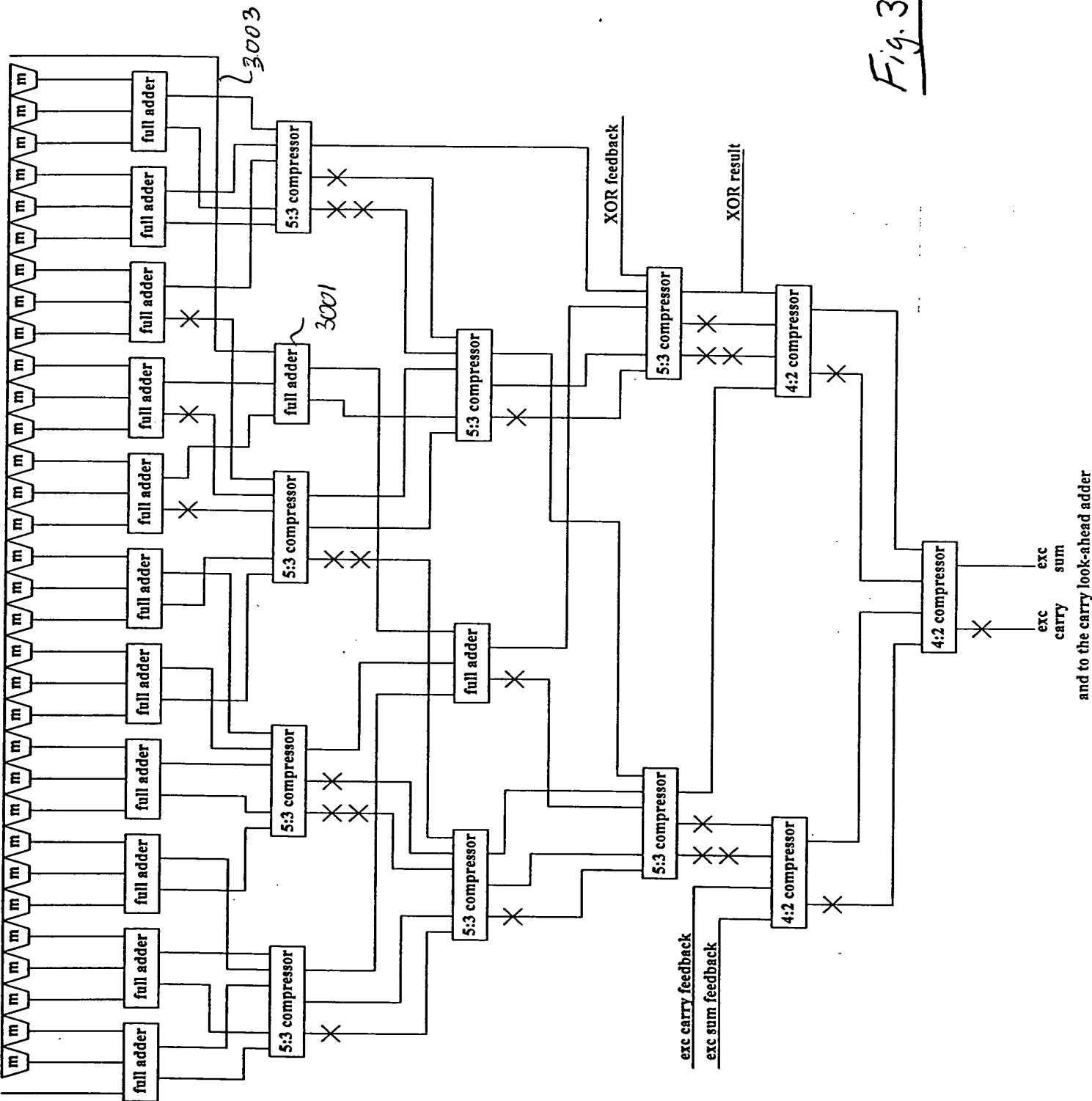
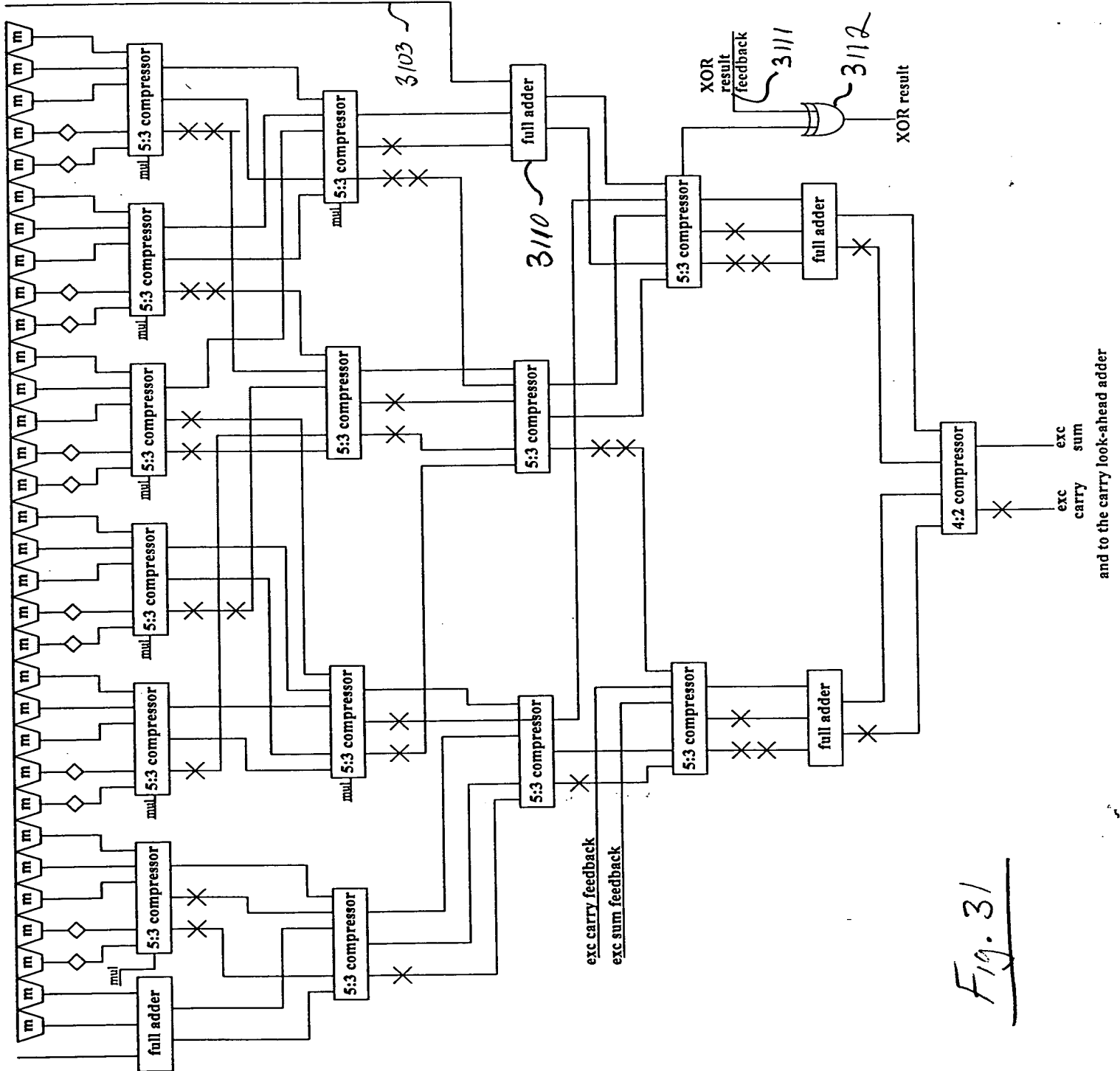


Fig. 30



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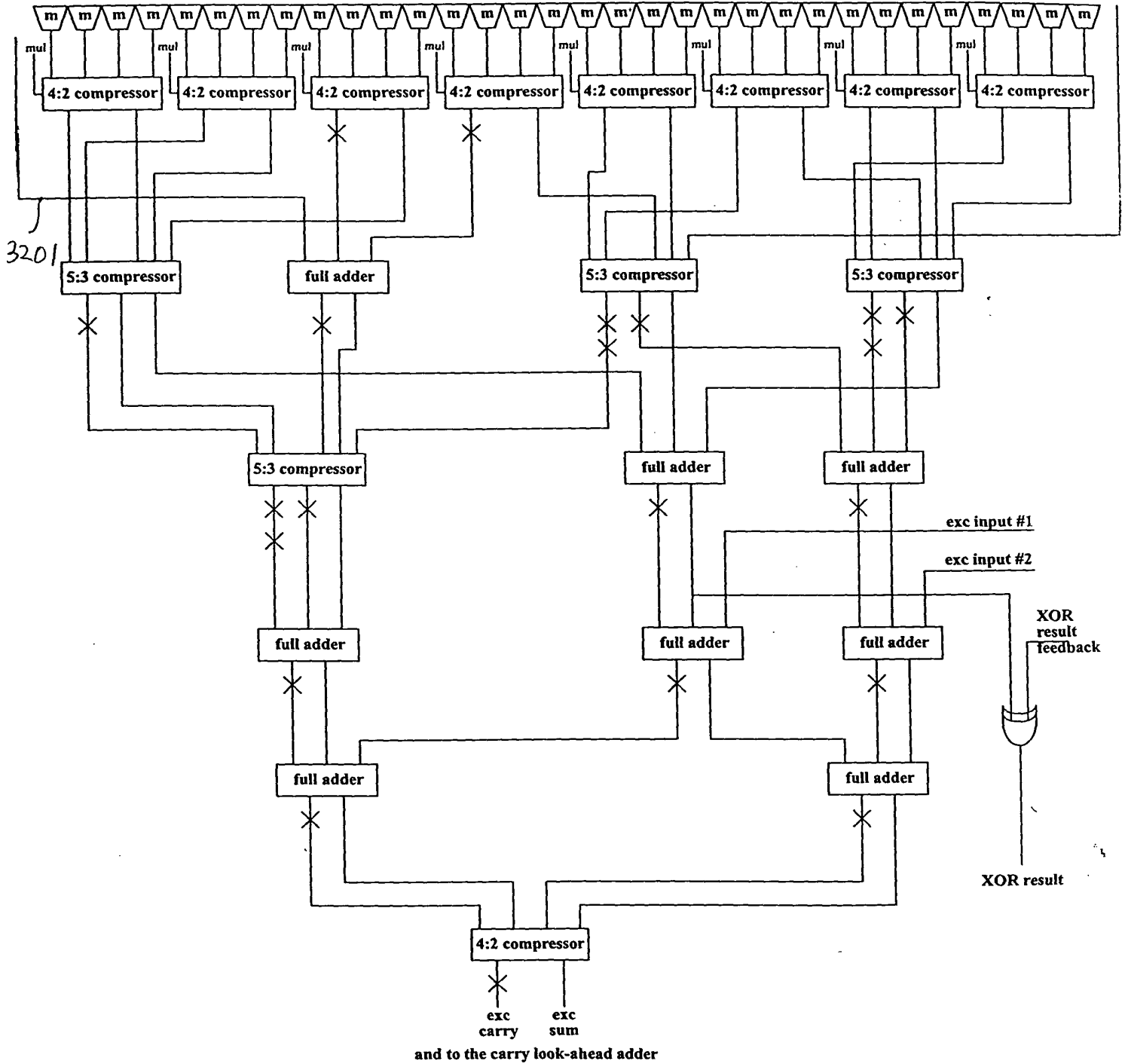


Fig. 32